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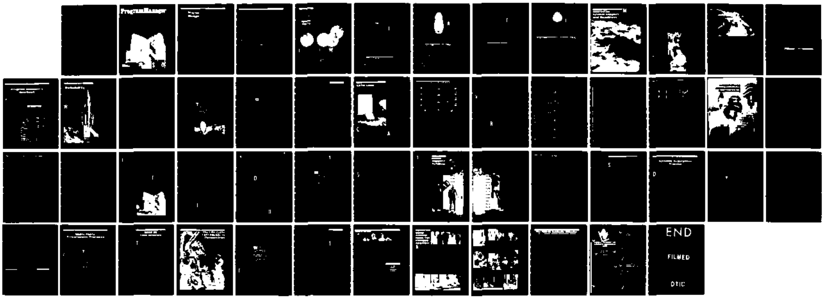

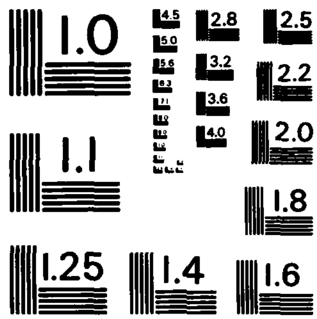

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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September-October 1984

ProgramManager

The Journal of the Defense Systems Management College

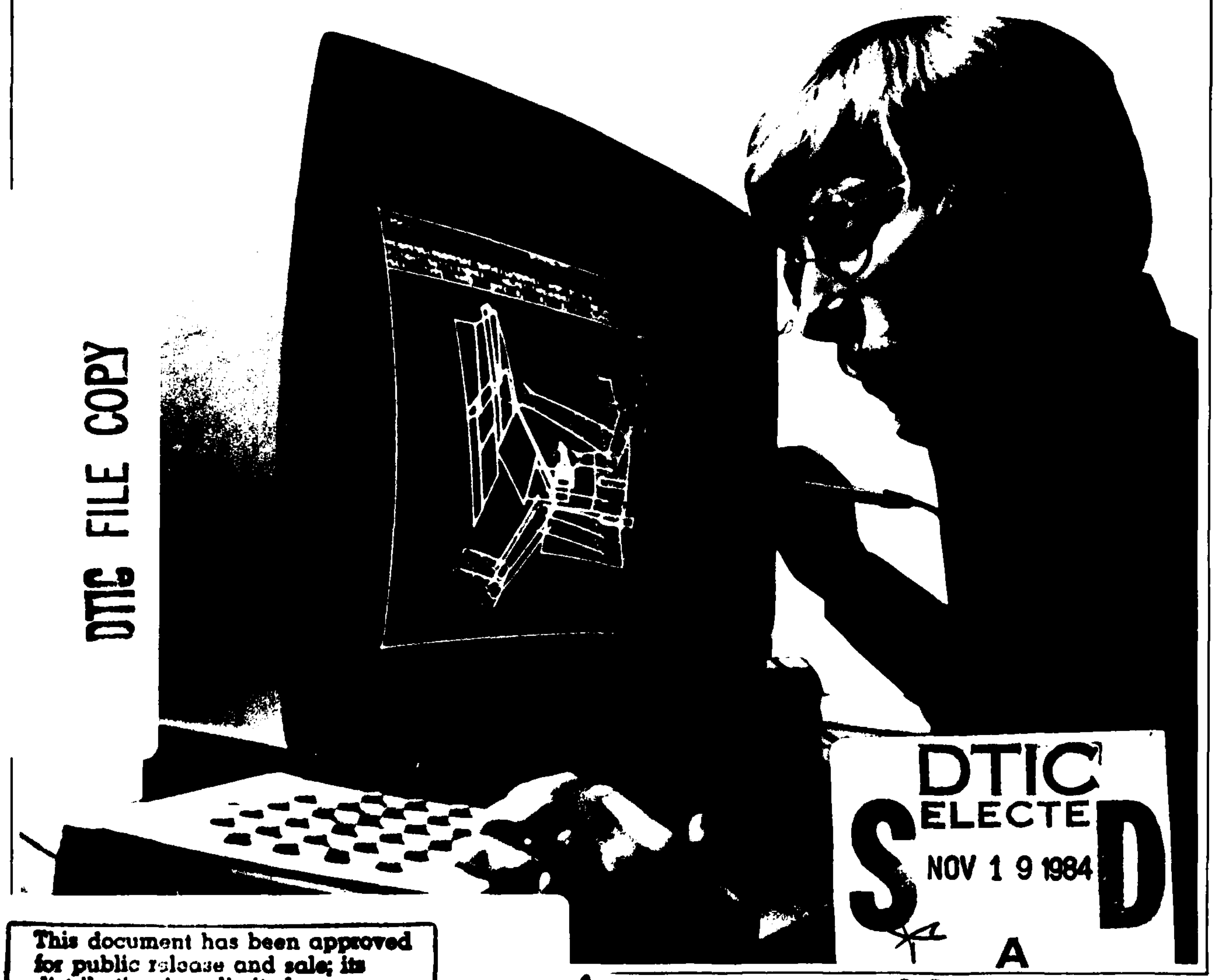
AD-A147 759

The Nuts and Bolts of Procuring Spare Parts

The Life-Cycle Cost Factor in Competition

Improving System Support and Readiness

A Focus on Computer-Aided Technical Management



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Cover: The COMBIMAN figure and workspace can be projected on the screen of an IBM 2250 Graphic Display Terminal in an off-axis perspective view. The designer can test and modify a workspace by interacting directly with the computer through the terminal. Photo Courtesy IBM Corporation

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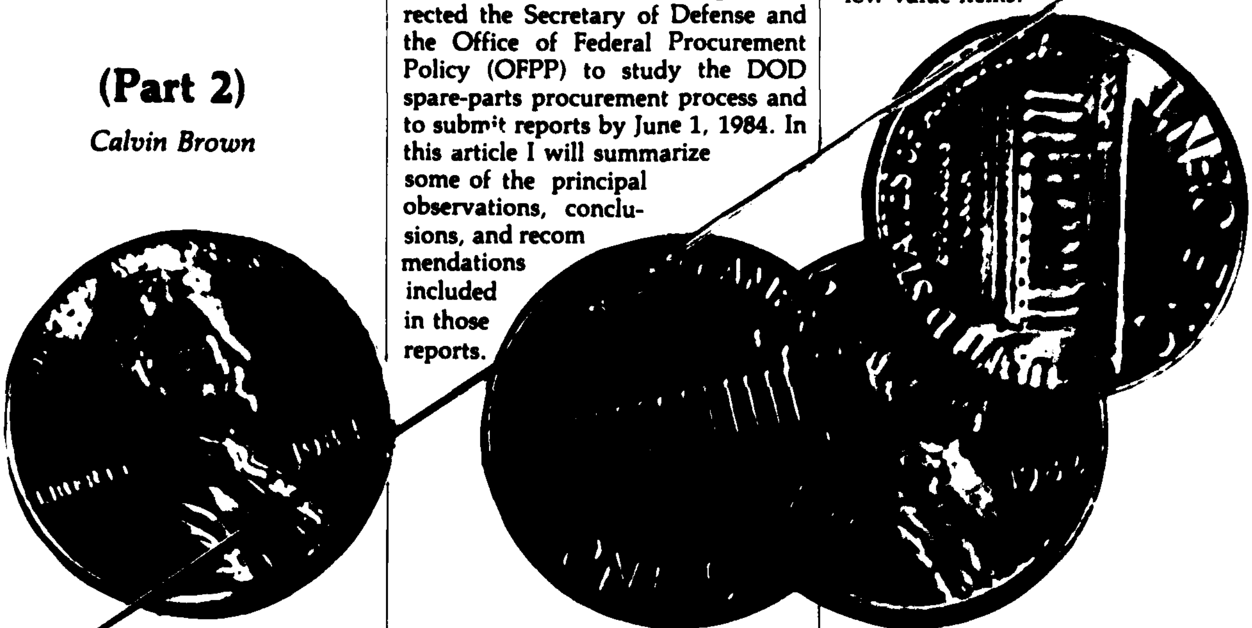
The Nuts and Bolts of Procuring Spare Parts

(Part 2)

Calvin Brown

...Or what to do when a four-cent diode costs Uncle Sam over a hundred dollars.



In Part 1 of this article (July-August 1984 *Program Manager*), I identified spare-parts overpricing as a two-sided problem. "Real" overpricing occurs when prime contractors act as "middlemen" between vendors and government buyers. They charge overhead and profit but add no value to the purchased items. It causes the Department of Defense (DOD) to buy fewer spares than it would otherwise, thereby impairing the readiness and sustainability of our fielded weapons systems. "Apparent" overpricing results from a contractor's cost-allocation method whereby he evenly distributes his total overhead costs over all items, both expensive and inexpensive. This distorts the prices for individual items, especially the low value ones and leads to a decrease in the public's confidence in, and support of, our entire defense establishment. Overcharging, which is fraud, refers to the deliberate decision to charge the government an excessive price for an item because the odds favor the government paying the price rather than questioning it. I discussed some of the poor procurement practices within government and industry that caused the problem, as well as some congressional and DOD initiatives to solve it.

In Part 2, I take a closer look at congressional and DOD initiatives and examine some industry initiatives. In late 1983, the Congress directed the Secretary of Defense and the Office of Federal Procurement Policy (OFPP) to study the DOD spare-parts procurement process and to submit reports by June 1, 1984. In this article I will summarize some of the principal observations, conclusions, and recommendations included in those reports.

Solving the Problem

In the case of overcharging, the remedy is obvious; audit, indict, convict and suspend, or disbar. In cases of "real" overpricing, the immediate remedy is to seek refunds for past incidents as directed by Defense Secretary Weinberger in his memorandum of July 25, 1983. For the longer term, we must determine "fair and reasonable" prices for spares and refuse to pay excessive prices or unjustifiable price increases. In cases of "apparent" overpricing, we must prohibit cost-allocation practices that result in unrealistic prices, particularly for low-value items.

We also must realize that good procurement practices, such as enhanced competition and ordering in economical quantities, are good spare-parts procurement practices. None of these remedies are new or esoteric; they are common sense, well-known, and were recommended in the 1960s when spare-parts prices were also newsworthy. Responding to the spate of horror stories uncovered by DOD and reported by the press, to public criticisms and congressional scorn, the entire defense establishment immediately—and predictably—reacted.

Most of us probably would readily agree upon two major elements required to solve the long-range spare-parts overpricing problem: (1) sus-

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tained, intensive management attention at each level within government, together with industry's cooperation and assistance, and (2) continuing commitment of adequate resources including personnel, funding, and data automation by the government. Let's look at specific steps various levels of government (Congress, Office of the Secretary of Defense, DOD components) and industry have taken to solve the problem.

Congressional Initiatives

Besides requiring the Secretary of Defense to submit a report to Congress by June 1, 1984, the FY 84 Defense Authorization Act directed the Secretary to issue regulations prohibiting the purchase of any part that increases in price above a specified threshold, unless the contracting officer certifies the price is reasonable, or the part is essential for national security. The Authorization Act also directed the Secretary of Defense to implement policies and procedures to ensure a long-term solution to the problems of excessive costs and long lead-times.

Numerous bills have been introduced and are intended to improve the DOD spare-parts acquisition process in such areas as competition and reprocurement data. (See Table 1.)

The FY 85 Defense Authorization Bill (HR 5167/S 2723) includes provisions that: direct the Secretary of Defense to issue "new regulations for allocating overhead to parts which the prime contractor had added little value"; changes the threshold in law for submission of certified cost and pricing data from $500,000 to $100,000; requires DOD to appoint an Advocate for Competition; requires DOD to procure spare parts in economical quantities where practicable; and requires that DOD personnel appraisal systems "give appropriate recognition to efforts to increase competition and achieve cost savings in contracting." This listing of congressional spare-parts initiatives is by no means complete, but it is indicative of current congressional concern about the spare-parts overpricing problem.

Diving Cannister Clamp
Before: $67.10
After: $ 1.80

OSD Initiatives

In Part 1 of this article, I discussed Supplement 6 to the Defense Acquisition Regulation, "DOD Replenishment Parts Breakdown Program," and the direction of the Secretary of Defense in his memoranda of July 25 and August 29, 1983, concerning spare-parts acquisition.

Let's look at OSD initiatives between January and June 1984. In February, direction was issued to require the identification of all spare-parts vendors as part of the provisioning process. This is intended to facilitate breakout and, where appropriate, competitive procurement. Direction was issued to mandate "value based cost allocation" vice allocation by requisitioned line item without regard to intrinsic value. This is probably the most important direction issued and it should have the most immediate impact. It will result in spare-parts prices being more comparable to the intrinsic value of the items. It will lessen both the public perception of gross overpricing in the case of nominal-value spare parts and misleading information for price-analysis purposes by subsequent buyers. In other words, a diode costing a contractor four cents would reasonably be priced at nine cents rather than $110. Direction was issued mandating use of "most favored customer clause" in negotiated contracts calling for commercial end-items or components. This will lessen chances of the government being charged higher prices than the contractors' most favored commercial customers.

The DOD Supplement to the Federal Acquisition Regulation was revised to restrict contract award "for any centrally managed spare or replacement part when the price of such parts has increased 25 percent or more in the most recent 12-month period." The only two exceptions are when the contracting officer certifies that the price increase is fair and reasonable, or the purchase is in the national security interests of the United States despite the price increase.

Because traditional approaches to major-system acquisition sometime disincentivize prime contractors from including or using spare parts that can be broken out, a model concept was issued May 10, 1984, providing for use of incentives to encourage the development of multiple-sources of supply.

In his memorandum of May 31, 1984, the Deputy Secretary of Defense announced that he would "continue to serve as the DOD focal point for sustained high-level management attention to the spares initiative." He directed each of the services and de-

Table 1. Congressional Initiatives

House Resolution (HR) 2133, HR 4269 and its companion Senate Resolution (S) 2434, HR 5064, and its companion S 2572, HR 5184, and S 2489 include numerous provisions intended to assist small businesses. Specific examples include setting aside all procurements under $25,000 for small businesses; increasing the number of Small Business Administration Breakout Procurement Center Representatives who seek opportunities to increase competition; removing prequalification requirements for small businesses; and prohibiting prime contractors from limiting direct sales by their subcontractors to the government. HR 4842, HR 5064 and its companion S 2572, and S 2571 are attempts to provide the government with more rights to technical data necessary to obtain spare parts from other contractors.

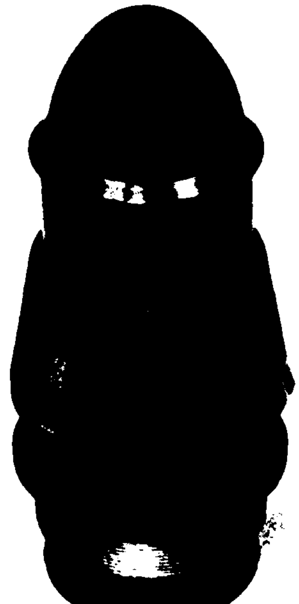
fense agencies to appoint one specific individual to serve as spokesmen to the public, the press, the Congress, and DOD.

DOD Component Initiatives[1]

Each DOD component has formulated, is implementinng, and is giving high-level management attention to a written, spare-parts initiatives program. (See Table 2.)

Special task teams have been established to review procurement data packages for currency, accuracy, and completeness. Data rights for competitive reprocurement are being evaluated and DOD has completed a study exploring the feasibility of acquiring reprocurement data and all data rights.

Additional resources have been assigned exclusively to value-engineering tasks. Value-engineering techniques applied by government personnel often reduce the cost of parts. Reverse engineering produces technical data suitable for competitive bidding for parts that otherwise are available only from a single source. In some cases, the services use reverse engineering to build carbon copies of items that have been out of production for a long time and data cannot be obtained. The dollar threshold for spare-parts contracts to contain a value-engineering incentive clause has been reduced from $100,000 to $25,000.



Flexible Flight Refueling Nozzle

Before: $1,095.00

After: $ 390.00

The DOD Parts Control Program is being applied mandatorily to all new systems in order to enhance the use of commercial or commom parts, or parts already in the inventory. The services are having prime contractors identify their vendors for all parts supplied in the provisioning phase of a contract and, in some cases, are directing vendor identification in the replenishment phase. The breakout program has been strengthened by new procedures.

A revised regulation with stricter procedures was issued in July 1983. Additional technical and engineering personnel have been assigned to implement the regulation. The regulation establishes a screening procedure to review data when the annual purchase value is $10,000 or more, but DOD components are screening parts below this threshold. Competition advocates and breakout managers have been designated at all procuring activities.

Procedures have been established to identify and resolve pricing anomalies and to restrict contract award when the price increases over 25 percent. Additional purchasing personnel have been assigned to analyze significant price increases, negotiate reasonable prices, and accurately justify and document the price in-

Table 2. DOD Component Initiatives

Army : The Army has its Spare-Parts Review Initiative (SPRINT) with 130 initiatives including objectives, actions and milestones. These 130 initiatives are grouped into eight categories or SPRINTs: (1) Give spare parts necessary attention, (2) Ensure that prices paid are fair and reasonable, (3) Implement DAR Supplement No. 6 "Breakout," (4) Eliminate disincentives on industry to breakout, (5) Optimize use of standard military parts, (6) Use value engineering to investigate prices, (7) Acquire reprocurement data restriction free, and (8) Automate data repositories.

Navy : The Navy has its Buy Our Spares Smart (BOSS) program that include 108 initiatives to improve spares procurement. These initiatives are grouped into the following ten functional areas: (1) requirements determination, (2) price surveillance, (3) breakout, (4) contract management, (5) competition, (6) training, (7) method of procurement, (8) automated systems, (9) pricing, and (10) resources.

Air Force : In 1983 the Air Force Management Analysis Group (AFMAG) was established. It studied the entire Air Force spare-parts acquisition process and made 178 specific recommendations to improve the process. The 178 AFMAG initiatives cover the following 13 major areas: (1) requirements determination, (2) contract policy, (3) financial management, (4) pricing, (5) contract provisions, (6) budgeting, (7) post-production support, (8) data requirements, (9) data rights, (10) resources needed, (11) provisioning, (12) policy implementation, and (13) source selection.

Defense Logistics Agency : The Defense Logistics Agency (DLA) is substantially augmenting its existing competition and pricing programs with increased emphasis on spare-parts acquisition and pricing support for the military services by the Defense Contract Administration Services Regions.

creases. The DOD components have directed contractors to change overhead cost-allocation practices that result in either distorted or unreasonable prices for spare parts. Equal allocation of overhead costs among all items in a contract has been barred.

Numerous voluntary refunds have been secured.

The Army has received four refunds totaling $212,000; the Navy has received 15 refunds totaling nearly $400,000; and the Air Force received 27 refunds in FY 83 totaling $457,000 and has refund requests for $7.8 million pending.

The Air Force initiated 51 debarments/suspensions in FY 83 as compared to 22 in FY 82, and has initiated nine debarment actions in FY 84.

Use of redeterminable basic ordering agreements has been eliminated in most instances, and significantly curtailed even when dictated by readiness and support considerations. Pricing "hot lines," which have been in existence for several years, have received increased emphasis. Reports of suspected overpricing receive prompt and thorough review by inventory managers in order to correct erroneous prices in the files, and to resolve instances of overpricing by contractors. Supporting this effort are the Navy Price Fighter, and the Air Force Zero Overpricing and Pacer Price programs.

Meetings have been held with defense contractors to seek mutual, corrective actions. The Deputy Secretary of Defense and top service officials have communicated with top industry chief executive officers. The Inspector General is continuing to perform audits of spare-parts acquisition. Corrective actions are being taken by the services as verified by the auditor's follow-up reviews.

In all DOD components, training curricula for personnel involved in spares purchasing have been expanded to include both entry-level training and refresher-retraining for journeymen. Personnel evaluation factors are being revised to consider the achievement of economical procurement. Greater emphasis is being placed on performance in keeping down costs and prices rather than achieving quantity production and speed. Modernized, automated, data-processing systems for logistics and technical data storage and retrieval are being studied and planned to improve processing requirements, procurement functions, and technical documentation systems.

The preceding discussion on DOD component initiatives has been somewhat general. A summary of the OFPP report to Congress on its review of DOD spare-parts practices, which includes the service and DLA initiatives, is contained elsewhere in this publication. In future issues of *Program Manager*, each of the services will discuss its particular initiatives in detail; i.e., Army SPRINT, Navy BOSS, and Air Force AFMAG.

Protective Shield
Before: $792.00
After: $ 20.00

Table 3. Industry Initiatives

a. Policy and Management

1. Support joint industry-government programs to increase competition and lower the cost of spare parts.
2. Establish competition advocates within companies.
3. Enhance work-force awareness company-wide through employee newspapers, awards, and intercompany coordination.

b. Requirements

1. Recommend buy-outs of significant spare parts in conjunction with final production runs. The term "buy-out" means buying enough spare parts to last for the remainder of the expected life of the equipment. If spare-parts requirements can be reasonably forecast, it is sometimes economical to buy all the spares with the last equipment production run. This avoids costly start-up and uneconomical quantity buys later.
2. Promote better procurement by refusing orders for less than economical quantities without specific instructions from the customer.
3. Put more spare parts in catalogs and identify the best quantity to buy to get the most reasonable price.

c. Breakout

1. Analyze selected parts to increase government awareness of their relative value and reasonableness of price.
2. Review make-or-buy decisions and change them to permit lower overall prices.

d. Pricing

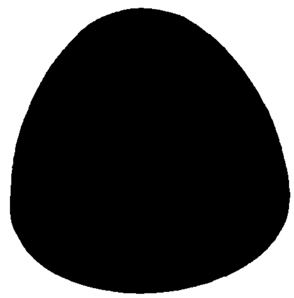
1. Review quotations to the government at a high management level before submittal.
2. Improve the accuracy of spare-parts prices in provisioning data submittals.

Industry Initiatives

Because the defense industry has been involved in spare-parts overpricing it would be naive and unreasonable to assume the problem could be solved without its participation and cooperation. Indeed, most companies in the defense industry have been deeply concerned about the poor press generated by the horror stories and have been actively supporting most DOD initiatives.

Conclusion

The OFPP report contains an excellent list of conclusions and recommendations for both Congress and the Department of Defense (see Table 4 for a summary). The OFPP was directed to include in the report ". . . such recommendations for legislation with respect to the procurement of spare parts as the office considers appropriate." The OFPP recommended that Congress hold off on legislative action until DOD reforms have had a chance to produce results. A cursory review of recently proposed legislation concerning spare parts will reveal that many members of Congress are attempting to legislate actions that have already been implemented in both DOD directives and service regulations. The good news is that Congress approves of those directives and regulations; the bad news is that by legislating those actions, much of DOD's implementing flexibility is lost.



Nose Fairing
Before: $381.00
After $ 7.50

Is there really a spare-parts overpricing problem? Yes. Is it a new problem? No. Is the defense establishment more interested in solving the problem or in getting rid of the current horror stories? The current Secretary of Defense, Deputy Secretary of Defense, and service chiefs have taken initial steps to correct the problem, both near-term and long-term. Whether the same interest and commitment is there next year or 5 years from now remains to be seen. That interest and commitment at the top is essential if service members, DOD civilians, and the defense industry are to continue implementing

(Continued on page 16)

Table 4. OFPP Conclusions and Recommendations

MAJOR CONCLUSIONS

—All the reform programs are ambitious. They need continued full support by OSD, service and DLA managers, and the Congress.
—DOD must learn how to do break-out in a cost-effective manner with realistic goals.
—Coordination of program and logistics management is vital to every aspect of the reform program.
—Planning for spares procurement must begin early in the acquisition process so that sources are identified and data obtained in a timely manner.
—Oversight of the spare-parts procurement reform program must be a prime responsibility of procurement executives at all levels.

RECOMMENDATIONS

For Congress

—Continue oversight of the reforms initiated by DOD, but hold off on legislative action until these reforms have had a chance to produce results. The reform programs will take several years and any additional legislation at this time could be counterproductive.
—Support budget requests for necessary people and data processing capabilities to carry out the reform program.

For OSD

—Provide strong and sustained leadership and management attention to ensure OSD initiatives are carried out.
—Sponsor a change to the Federal Acquisition Regulation to make it clear that contractors must furnish cost or pricing data for procurements over $500,000 when requested by the contracting officer.

For Department of Defense

—Ensure timely and accurate assignment of acquisition-method codes. Challenge data rights and restrictive markings.
—Ensure that acquisition strategies and source-selection procedures adequately consider spare parts.
—Require contractors to:
Identify original manufacturers early and throughout the acquisition cycle.
Increase competition among vendors.
Provide complete cost or pricing daa when needed.
Submit accurate and complete technical data and warrant their conformance to contractual requirements.

Improving System Support and Readiness

Lieutenant Colonel Robert E. Cochoy, USAF

Much has been written about reliability, availability, maintainability (RAM) and logistics support of modern, complex weapon systems. Unfortunately, this abundance brings to mind the old saw about the weather—everybody talks about it but nobody does anything about it. Perhaps exaggerated when applied to the emphasis of RAM in the systems acquisition process, the saying highlights one of the largest disconnects in program management between policy and the actual business of systems acquisition.

The M-1 Tank is a primary ground weapon system.

Photo courtesy of General Dynamics

Except for a few noteworthy cases, RAM considerations at the program-manager-level do not receive the same attention as policy dictates they should. In this paper I attempt to make the point that systems support and readiness is an attitude, not a program, and the earlier it is considered in the acquisition process, the greater the cost-effectiveness leverage. Further, I discuss possible causes for this disconnect between stated RAM policy and actual practice and propose several suggestions for alleviating the problem.

The recent high-level interest in improving system support and readiness was initiated when Frank Carlucci, then Deputy Secretary of Defense, published the original 31 "Carlucci Initiatives" in April 1981. Of the 31 areas selected by Mr. Carlucci for special attention (another initiative was added in July 1981), five concerned the subject area.[1] The initiatives, known as the Acquisition Improvement Program (AIP), prompted the revision of DODD 5000.1, DODD 5000.39, and DODI 5000.2 to increase the priority of support and readiness. These revised documents clearly raise readiness and supportability considerations to a level equal in importance to cost, performance, and schedule considerations. The documents now call for readiness goals to be included as part of the design objectives for new systems established at Milestone I.[2] In January 1983, Paul Thayer replaced Mr. Carlucci, and in May 1983 he consolidated the 32 initiatives into six broader goals to personally concentrate on. One of these six is Improved Support and Readiness, which included the five related AIP initiatives (Actions 9, 12, 16, 30, and 31).[3]

High-Level Interest

At this point one might ask: "Why all this sudden high-level interest on the readiness and supportability issue?" I believe a primary reason for this increased emphasis is the rapidly changing character of readiness and supportability since World War II. The relatively simple design of World War II equipment led to the notion that readiness and supportability meant "getting there first with the most" and keeping the logistics supply-line filled with ammunition and troop-support items.

Today's battle strategy has changed. Now we are expected to "fight outnumbered and win." Our enemy turns out large numbers of comparatively simply constructed weapons. They emphasize low-unit cost, low operation and maintainence cost, simplicity of design, commonality, manufacturability, reliability, availability, maintainability, and logistics supportability over consideration of performance enhancement through high technology.[4]

Unable to match our enemy's weapon systems in numbers, we incorporate superior technology in our systems as a "force multiplier." The proliferation of fewer highly sophisticated, functionally integrated weapons systems, driven by multiple-digital computer systems and other elaborate electronic components, casts a new meaning on support and readiness. Logistics support and readiness requires a different mind-set than ever before. Today, more than ever, supportability and readiness require careful consideration during very early design rather than after deployment.

Complicated Weapon Systems

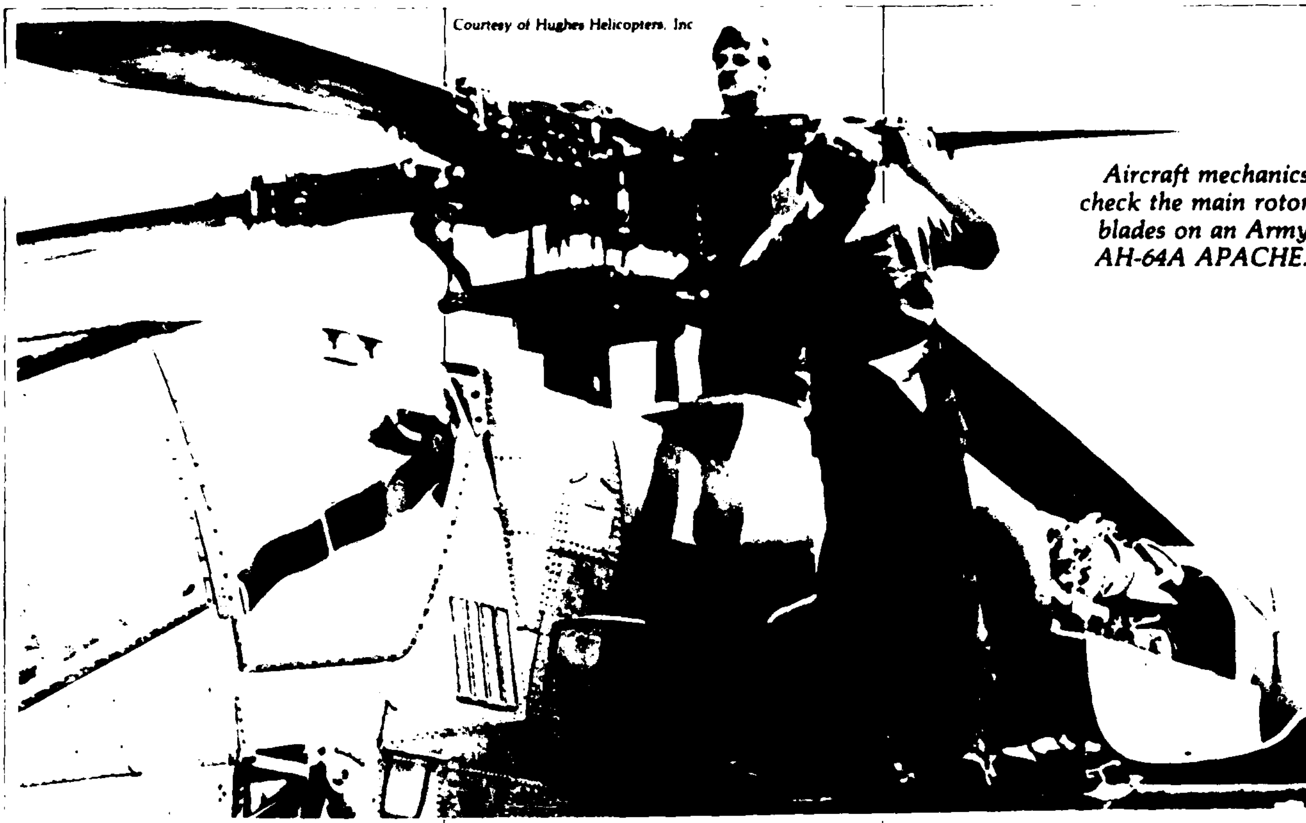
The recent high-level concern about readiness and supportability is therefore directly related to the large numbers of complicated weapons systems being developed without sufficient regard for their "care and feeding" on the battlefield. Leaders are realizing that cost-effectiveness means more than a low-unit cost. It is a function of both system-cost and system-effectiveness which includes strong consideration for dependability and readiness in the field. Further, cost-effectiveness deals with total life-cycle costs of the system, not just initial acquisition costs. Operations and Support (O&S) costs now represent 60–80 percent of the life-cycle costs of Department of Defense systems.[5] The future DOD budget will not allow for these expensive support costs. The FY 85 defense budget predicts the proportion of the defense budget for procurement during FY 84–87 will *increase* by 3.5 percent while operations and support funds will *decrease* by 1.3 percent. These figures reflect the clear intention of our leaders to force down the ever increasing operations and support costs of modern weapon systems.

With all this high-level emphasis on improving system support and readiness, one would think this subject would be the foremost concern of every program office. Although specific changes to improve system readiness have been made in such systems as the ASW Stand Off Weapon, DIVAD gun, AH-64, GLCM, LAMPS, Patriot, and the M-1 Tank, program office and contractor actions in this area do not generally reflect the high level of Department of Defense concern.[6] The "grass-roots" management in the program office is hindered from supporting his high-level emphasis in supportability and readiness for several reasons.

Production of General Dynamics Tomahawk cruise missiles will increase significantly over the next several years as Tomahawks are deployed on submarines and surface ships, including battleships.

General Dynamics Corp. Photo

Courtesy of Hughes Helicopters, Inc



Aircraft mechanics check the main rotor blades on an Army AH-64A APACHE.

First, the program manager is still rewarded on the basis of program cost, schedule, and performance even though Department of Defense directives clearly establish readiness and supportability on an equal footing with these parameters. This reward system requires the program manager to go for as much performance as he can and provide for a pre-planned product improvement (P^3I) program later on for logistics supportability.

Second, the contractors have little incentive to support improved designs for RAM for improved systems support and readiness.[7] The contractor makes more money selling completed systems than he does in fabricating spare parts. If the system is more supportable, he sells fewer end-items and fewer spares.

Third, Congress is ultimately unwilling to stand up for greater up-front costs for RAM in new-weapon acquisitions for the simple reason that there exists no constituency or strong lobby for spare parts or for built-in RAM.

Finally, it is difficult for the program manager to support RAM for the simple reason that it is not glamorous. The program manager must constantly be "selling" his program through all levels of service and Department of Defense management. Unfortunately, the "flashier" a program, the easier it is to garner funding support. When a funding cut comes, the program manager must preserve his program's strongest selling point (usually performance) and delete RAM requirements.

Recent Actions

Considering the strong obstacles the program manager faces in providing for RAM in his program, it is appropriate to consider some recent actions and suggestions to help him get in step with the new thrust in increased RAM.

It has been estimated that 70 percent of the life-cycle costs (LCC) for a system are established as a result of design decisions made prior to DSARC I.[8] It is clear, therefore, that the earlier in the systems design that RAM is considered, the greater the LCC leverage that can be expected from expenditure of those RAM funds. Extrapolating this concept further, it can be postulated that the greatest leverage can be obtained by developing reliable componentry within the laboratory system (6.2 and 6.3A funding) well before system concept exploration. The challenge is to determine 1) which componentry improvement programs provide the best return on investment in terms of RAM improvement, and 2) how to transition that improved componentry into an emerging weapons system (i.e., 6.3B and 6.4 funding).

The Joint Logistics Commanders recently established a Joint Technical Coordinating Group to examine laboratory efforts across all the services dealing with logistics supportability, including RAM efforts. The idea is to more efficiently use laboratory dollars for RAM by reducing duplication in the services. In Program Budget Decision 601, the Department of Defense directed the Air Force to program approximately $40 million per year across seven 6.3A and four 6.4

■ *Lieutenant Colonel Cochoy is Chief, Chemical Defense Division, Life Support System Program Office, Deputy for Aeronautical Equipment, Aeronautical Systems Division. He is also a graduate of PMC 84-1, and this "think piece" was written in partial fulfillment of that course.*

program elements in FY 84 and FY 85 for logistics related research and development. The expected outcome of this initiative is primarily to develop improved electronic component reliability in such critical items as radar and digital flight control and also to provide for development of automated technical orders for improved maintenance support. Further coordination is underway at Headquarters United States Air Force, Headquarters Air Force Systems Command, and the Air Force laboratories to identify, categorize, and specially manage logistics-related 6.2, 6.3, and 6.4 efforts in the logistics area. The goal is to provide the laboratories with subsystem reliability requirements to work toward highly reliable systems (i.e., two-level maintenance concept). Hopefully, these laboratory efforts will reduce the technical risk sufficiently for the program manager to transition these validated technologies into his system to reduce total system life-cycle cost. Increased laboratory emphasis in the logistics research and development area is needed to ensure adequate risk reduction of these component technologies. A primary reason for the recent management transfer of the Air Force laboratories from Headquarters Air Force Systems Command to the related product divisions was to facilitate this technology transfer to new systems.

Develop Minimum RAM Thresholds

Another approach supporting RAM consideration in the program office is to develop minimum RAM thresholds in a program, below which the service recommends abandoning the effort due to lack of operational effectiveness or supportability. This could be affected through headquarters coordination of the program management directive, and the incorporation of these thresholds in the program baseline. The RAM standards could be reflected in the system, development, and product specifications as the system matures.

The program manager can incentivize the contractor to provide greater consideration for RAM through incentive award fees, warrantees on RAM critical componentry, and RAM value-engineering-change clauses. The services could assist in this effort by encouraging greater contractor research and development investments in the RAM design area. The F-18 program had considerable success in incentivizing RAM through contract award fees. The Navy earmarked a total of $39 million for contractor incentives to hold down operating and support costs on the F-18. Of this total, a $12 million incentive-award-fee was keyed on mean-flight-hour between failure performance, which was a major factor in bringing about a projected $260 million cost avoidance in projected system maintainability costs.[9]

Finally, the program manager could enhance RAM for his system by using standard componentry (power supplies, displays, etc.). These common components could be improved and applied to multiple systems through the Form, Fit, and Function (F^3) process whereby the improved component can easily replace the old component. This represents sort of a multiple system P^3I capability whereby laboratory state-of-the-art advances in electronics could be incorporated in many different systems with common interface requirements. Although upgrading through the F^3 process would entail additional funds in terms of spares, tech data changes, etc., some of these costs could be amortized over many different weapons systems.

Formidable Obstacles

It is clear that it is not going to be easy for the program manager to comply fully with Department of Defense policy concerning improved system support and readiness.

Formidable obstacles lie in the path of a program manager with even the best of intentions for fielding the most supportable and effective system he can build. In this paper, I have highlighted some of those obstacles and have outlined approaches, both underway and suggested, for countering them. ■

Notes

1. G. Dana Brabson, Colonel, (USAF-ret.) "The Defense Acquisition Improvement Program," *Program Manager*, Nov.-Dec. 1983, pp. 5-13.
2. Harvey Gordon, "Acquisition Improvement Program Second Year-End Report," May 18, 1983.
3. Brabson.
4. Paul J. McIlvaine, "Design Balancing—U.S. Technological Attitudes are Changing," Proceedings of the Society of Logistics Engineers, Eighteenth Annual Symposium, 1983.
5. *Ibid.*
6. Gordon.
7. James P. Mullins, General, (USAF-ret.) "Establishing Supportability as a Critical Requirements Factor," *Defense Management Journal*, Fourth Quarter 1983, pp. 3-6.
8. Brabson.
9. Charles L. Kirkpatrick, "Taking the Sting Out of the Hornet Support Costs," *Defense Management Journal*, First Quarter 1984, pp. 3-7.

INSIDE DSMC

PMC Graduate Update

PMC 78-1

George P. McGee has been promoted to lieutenant colonel, and is the new Project Director, CH-47 Flight Simulators, Office of the Product Manager for Aviation Training Devices, DRCPM-AVD, Orlando, Fla., 32813.

PMC 82-1

Jeffery C. Hovious has been promoted to lieutenant colonel and is the Department of the Army Regional Representative to the Federal Aviation Administration (FAA), Western-Pacific Region, P.O. Box 92007, Worldway Postal Center, Los Angeles, Calif. 90009

PMC 83-1

Major Donald L. Davis has retired from the U.S. Marine Corps and is now employed by Advanced Technology, Inc., Reston, Va.

PMC 83-1

Nick Reynolds has been promoted to GM-14 and assigned as Chief of the Airlift and Trainer Engine Branch within the Directorate of Contracting and Manufacturing, San Antonio Air Logistics Center, Kelly AFB, Texas. The branch has contracting responsibility for the C-5, T-37, T-38, C-130, and A-10 propulsion systems. ■

On the Way!

Program Manager's Notebook

The Defense Systems Management College Research Directorate is going to produce a *Program Manager's Notebook*; it will be authored by members of the DSMC staff and faculty—but we need your help. More on that later.

The *Program Manager's Notebook* will provide program managers with a ready reference document that will contain basic information and a reference list on selected subject areas of interest or concern to them. The fact sheets, approximately six pages in length, will be designed to provide:

—Ready reference to brush up on a topic without searching through lengthy reports, studies or articles;
—Essential summarized guidance for performance of functions or preparation of documents in the selected subject areas;
—Succinct summations of the Department of Defense and, if appropriate, service philosophy and policy regarding acquisition subject areas.

This guidance will assist program managers as they perform the functions and prepare the documents associated with the systems-acquisition cycle. The notebook will not attempt to provide guidance for accomplishment of service-unique functions or preparation of service-directed documents. It will not be all-inclusive. In those instances where DOD references/examples are sufficient to provide a suitable model, a single service's references/examples will be used to construct a model.

The Table of Contents will identify the subject area for which fact sheets will be immediately available as well as those yet to be published and distributed. The loose-leaf notebook format was selected for ease of use and update. As new or revised fact sheets are available, they will be distributed with a revised and dated Table of Contents; the user need only to replace the old with the new. No posting will be necessary.

Comments Welcome

Please send your comments to Professor Edward Hirsch, Defense Systems Management College, Research Directorate, Fort Belvoir, Va., 22060-5426.■

The Subject Areas

The subject areas we have tentatively identified for inclusion are listed below. The first eight are general in nature, the rest are pointed toward specific actions a program manager may have to complete:

—An Overview; Government Acquisition Policies
—An Overview; System Life Cycle
—An Overview; the Planning, Programming and Budget System
—Support Available from the Defense Systems Management College
—Civilian Personnel Management
—The DSARC Players and Process
—Contract Types
—Foreign Military Sales
—Developing the Acquisition Strategy/Acquisition Plan
—Establishing the Program Data Library and Repository
—Developing the Plan of Action and Milestones
—Developing the Program Security Manual
—Developing the Project Master Plan
—Developing the Information Management Plan
—Developing the Program Milestones and [illegible]
—Developing the Plan for the [illegible]
—Developing the Risk Assessment Plan/Conducting Risk Analyses
—Developing the Design-to-Cost Life-Cycle Cost Plan
—Developing/Selecting the Cost Estimating Techniques/Relationships
—Developing the Integrated Logistics Support (ILS) Plan
—Developing the Financial Management Plan
—Developing the Work Breakdown Structure (WBS)
—Developing the System Engineering Management Plan (SEMP)
—Developing the Preplanned Product Improvement Program
—Developing the Configuration Management Plan
—Developing the Training Plan
—Conducting the Trade-Off Sensitivity and Analyses
—Developing the Test and Evaluation Master Plan (TEMP)
—Developing the Production Plan
—Evaluating the Cost/Schedule/Technical Progress
—Conducting the Technical/Reviews and Audits
—Determining the Appropriate Contract Type
—Developing the Competition Plan

We want this to be of help to you—not to serve as a bookend, space-filler or dust-collector.

—Will such a document help you?
—How can we improve the concept, substance, format?
—What additions/deletions to the list of fact sheets do you suggest?■

VIEWPOINTS

Reliability
Key to Cost Reduction

General James P. Mullins, USAF, (Ret.)

These remarks were delivered earlier this year at Martin Marietta, Denver Aerospace, by General James P. Mullins, when he was Commander of the Air Force Logistics Command. General Mullins is now retired.

When we talk about national defense in our society, we're really talking about a joint venture between the military and private industry. We have no arsenal system as such, and, therefore, the government does not design and build weapon systems; for that, we rely on private enterprise, with its innovation, know-how, and free-enterprise competition.

The F-15 is an Air Force air-superiority fighter.

The great strength of our nation's military does not come from superior numbers. It comes from superior weapon systems and using technology in smarter ways than our potential adversaries know how to. That's why the responsibility for the defense of our democracy lies with both the military, which must be ready to fight to protect it, and private industry, which must provide the military with the wherewithal.

It is our joint responsibility to provide for a defense that we know can do the job and one which, at the same time, this nation can afford. Given the finite resources we have to work with, and the fact that our future defense needs will probably continue to outstrip the resources available to us, we must find an effective way to get more combat capability for the investment we're making.

Fulfill Commitments, Save Billions

What if I told you that there is a practical way to do just that—for the Air Force to have the capability of fulfilling all of its military commitments, anywhere in the world and at any time and, in the process, save billions of dollars annually that could then be used to address what deficiences might still exist in our defense programs? What if I told you that the only reason we haven't done so already is not that we don't have the wherewithal but, rather, that we've

been trained to think in terms that simply will not allow it to happen?

Assuming your answer to both of these questions is "yes," I'm sure you'll be interested in knowing that what I'm talking about here—the initiative I'm proposing—is not some mindless fantasy or "pie in the sky." Purely and simply, it's better system reliability, and it's available today.

It's been said with some justification that we're a "use and replace" society. Believe it or not, there are studies that show only 5 to 15 percent of what the average American throws away on any particular day could truly be classified as "garbage." Much of what we don't want anymore is either stuff that is broken, or stuff that we know from experience will be broken if we use it much longer.

Industrial Revolution Legacy

During much of the Industrial Revolution, our machines were, of practical necessity, unreliable. Progress is inevitable, and even when crude technology responds to a real need, it will be used. For example, during the 1800s, we invented incandescent bulbs to light our way, pneumatic tires to carry heavy loads, and the telegraph to better communicate with our own kind. But those bulbs often burned out in a matter of hours, pneumatic tire tubes were notoriously unreliable, and telegraph lines were frequently down.

We accepted unreliable machines in those days because we simply didn't have the technology available to build them better. In many cases, just to build them at all pushed at the outer envelope of our capability.

Example, the Auto

We need only to look back at the early automobile for a prime example. In those days, people without mechanical repairs didn't drive alone. It was a rare outing, indeed, when a hose didn't break, a radiator didn't boil over, or a tire didn't go flat. While many of the old engines turned out to be surprisingly durable, one keeping a car for any length of time could plan on burned-out clutches, failed magnetos, and broken fan belts.

Automobiles today are more reliable in many respects, although they still leave a great deal to be desired, especially considering how far we've moved up on the learning curve for much of the technology we're using. Look at the well-documented new car recalls issued by the manufacturers each year for problems in fuel, electrical, and cooling systems. And realize that these defects do not occur because we don't fully understand carburization, current flow, or thermodynamics. These defects have occurred because we haven't tried hard enough to design them out.

A quick look at the predicted automobile repair incidence in this year's *Consumer Report Buying Guide* will demonstrate a striking dichotomy in terms of reliability between virtually all the cars we design and build in this country, and those designed and built by certain foreign competitors. It's not that it can't be done at competitive prices; it's that we just haven't been doing it, which makes absolutely no sense at all.

The cost of automotive unreliability in this country today is staggering, and not just in terms of jobs and prestige lost to foreign competition. Department of Transportation statistics show that if a typical American car owner keeps a car for 100,000 miles or so, chances are he'll have to replace the water pump, alternator, brake pads, starter, fuel pump, catalytic converter, lower ball joints, and have substantial work done on the transmission and carburetor or fuel injection system.

That's why each year, with energy costs as high as they are, Americans still spend only about $6.5 billion on gas and oil, while they spend a whopping $26 billion on auto repairs. But such is the dollar cost of automotive unreliability. We haven't even considered the other costs of having a car break down; costs in terms of inconvenience, lost opportunities, work missed, vacations ruined, and lives endangered.

The real question is why we've allowed this to happen. I believe the answer is that, over a period of time, we came to accept a standard of unreliability in cars. That's why it wasn't that long ago when most Americans traded for a new car every 2 years or so, because not to do so was considered to be "asking for trouble." At that time, prices and interest rates were low enough to make frequent trading an easy, workable solution to what had become the "given" of unreliability.

System Failures No Mystery

Now what does all this have to do with the Air Force and fulfilling military commitments? Well, like the Americans and their cars, the Air Force has followed suit, somehow accepting the lack of reliability as an inherent given of high technology weapon systems. Yet, like carburetor problems and car electrical system failures, the causes of weapon system unreliability aren't a mystery to us. We know precisely what causes parts to break and can predict precisely when failures will occur. More importantly, we have the technology and know-how today to design and build them so that they will not break—at least not nearly as often.

The reason we haven't done this is that we've trained ourselves not to think about unreliability, or acknowledge the impact it has both in terms of combat capability and dollars.

Like so many American car buyers today, we seem to accept the fact that our machines will break, and that such failures are the inevitable price we must pay for our reliance on sophisticated, high technology.

That mind-set, more than anything else, is responsible for our designing and building systems to go fast and high, but not to do so reliably for any length of time. That mind-set is responsible for degradations we're now seeing in weapon system readiness and sustainability, and the tremendous number of defense dollars we're now faced with allocating just to keep these systems going.

Wartime Tasking and Unreliable Weapons

Let's talk about the toll unreliable weapon systems are taking on our ability to fight and win wars today. We all know that our strategy and tactics are built around the power of modern military technology. It follows, therefore, that to the extent the necessary technology can't be supported, our strategy and tactics must be called into question. That's why

the true measure of merit of our weapon systems today is not whether they look good on the ramp or how high or how fast they can fly, but it's how reliably they can do their wartime tasking.

When we look at the probability of system effectiveness in the wartime scenario, we have to look at several indicators. The context, of course, is the mission. In the case of many front-line combat aircraft, that equates to the destruction of an enemy target, or what we call "damage expectancy."

To determine damage expectancy for a particular weapon system tasked under a particular war plan, we consider four factors, including launch success, weapon system reliability, probability of penetration, and probability of kill. For a typical system tasked, it is not unusual to find both the probabilities of launch success and target penetration to be up around the 98th percentile, meaning they're so good that they don't really significantly degrade the probability of mission success.

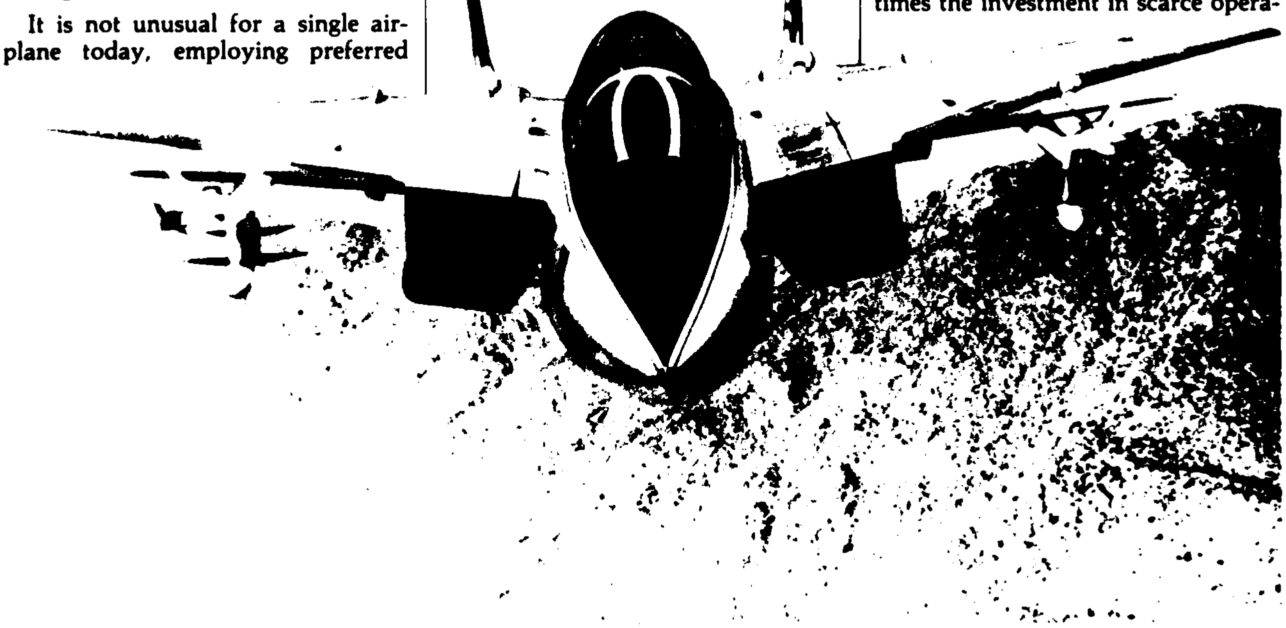
But then we have to consider the other two factors: probability of kill, and system reliability. At one time, the probability of destroying a target was significantly lessened by the munitions employed. But today, using preferred munitions, like state-of-the-art missiles and "smart" bombs, we can vastly improve the likelihood of hitting what we aim at.

It is not unusual for a single airplane today, employing preferred munitions, to have the same probability of destroying the target as, perhaps, 10 similar weapon systems using older, more traditional ordnance. The advantages of state-of-the-art munitions are so great that what was once a serious limiting factor is no longer a significant consideration, at least not when preferred munitions are employed.

This means that in terms of being able to accomplish our wartime tasking, we have already successfully dealt with three of the four factors determining weapon system effectiveness. But what about reliability, that one remaining factor of weapon system effectiveness? How much degradation of system effectiveness would we expect the lack of reliability to cause in the typical wartime scenario?

This two-seat carrier-borne fighter can simultaneously track 24 targets and direct attacks against any six . . .

The Navy has achieved a 2,000-hour MTBR with its F-14 TACAN.



To figure that, we have to look at the reliability of each system critical to the mission in terms of the length of the mission sortie. In other words, we look at the chances that all the critical systems will function reliably for the entire mission duration. For example, if, say, the bomb-NAV system were to have a mean time between failures (MTBF) of two hours on an aircraft tasked to do a six-hour, high-precision bombing mission, then it really wouldn't matter if all the other systems were working 100 percent. That single bomb-NAV system would, in and of itself, be the limiting factor. And remember that all of those other systems probably would not be 100 percent reliable.

System Reliability: Most Limiting Factor

Consequently, the reliability of that bomber to do the mission would be no better then the likelihood of its bomb-NAV system, along with all its other critical systems, functioning properly for the duration of the mission. That's why, in terms of wartime tasking, system reliability is the single most significant limiting factor. That's why, given our typical system reliability today, instead of sending one airplane to do a particluar job, we'd often have to send three to achieve the same probability of success.

Thus, the lack of reliability, in a typical case, would equate to three times the investment in scarce opera-

tional assets, three times the investment in highly skilled people, and three times the likelihood of combat losses.

The bottom line is that we already have a good handle on launch success. We know we can penetrate to the target and we can be assured that, with the right munitions, we can destroy the target. The only way we can effectively compensate for the inherent unreliability of our systems, the low mean time between failures we're now experiencing, is to task more sorties for any particular mission.

This will give us the combat capability we need, but only if we have the required additional systems ready to go whenever and wherever needed; only if we have the additional preferred munitions available whenever and wherever needed; only if we have the additional flight crews, skilled technicians, sophisticated maintenance facilities, war-readiness kits, replacement engines, and whatever other support is required ready to go whenever and wherever needed. And believe me, these days there are some very big "ifs" to be considered.

This takes into consideration the speed at which conflicts can now develop and how spread out our vital interests are in the world today; and the result of the many years of neglect and the vast shortages we now have in follow-on support.

That's why the single greatest limitation to our having the combat capability we need today is logistics. That's why the single greatest impediment to our having the kind of logistically supportable systems we must have is the lack of system reliability. That's why our real leverage in generating combat capability comes first and foremost in the area of reliability improvement.

What I'm talking about here can be accomplished with only relatively small gains in reliability. To achieve the effectiveness our force really should have, we'd only need an MTBF of around 1,300 hours. That alone would give us the reliability we'd need to efficiently and effectively accomplish the wartime tasking, substantially reduce the probability of our suffering combat losses, and greatly enhance the deterrent value of our forces.

And frankly, in my mind, that's not too much to ask when the technology to do so is already substantially bought and paid for, when we've already built highly complex systems with 10 to 30 times that level of reliability, and when the security of our nation and the Free World increasingly depend on our doing so.

Our real leverage in generating combat capability comes first and foremost in the area of reliability improvement.

Benefits of High Reliability

The 1,300-hour mean time between failures would certainly do much to give us the combat capability we need to defend our vital interests around the world. But how about a 2,000-hour MTBF, which the Navy has already achieved in its F-14 TACAN? How much force degradation over time would that compensate for? Or how about a 10,000-hour MTBF F-15 signal processor, which Very High Speed Integrated Circuit (VHSIC) technology now makes possible? Or how about a 40,000-hour MTBF, which is now being predicted for the ring laser gyro? Or how about a totally reliable weapon system, one which would need virtually no logistics support, save only for consumables like fuel and munitions?

Pause for a moment and think of the enormous, almost incalculable benefits that would accrue from such reliability. Think about the force multiplier we would gain by having, say, first-line fighters that could deploy without specialized maintenance capabilities, war-readiness kits, replacement engines, and the multitude of other things our present systems need to go to war today. Think how much more secure the Free World would be.

The up-front cost of making this kind of investment in reliability would be high. There's not much doubt about that. Perhaps it wouldn't be as high as many of you might think. Without a doubt, the return in future cost savings alone would stagger the imagination, especially when one considers that we now keep our weapon systems for 20 to 30 years.

Reliability and Cost Savings

Try to imagine how much less our entire defense program would cost over a 30-year period if we could only get a handle on logistics dependency with increased reliability. Imagine the cost reductions in maintenance. Imagine the potential savings in reduced airlift requirements, from transports to flying hours. Imagine what it would mean if we didn't have to recruit, train, and deploy as many maintenance technicians.

Across the board, we wouldn't need all those facilities and equipment, and we wouldn't have to buy all that material. Avionics intermediate shops would become a thing of the past. Depot purchase equipment maintenance would become a thing of the past. Frankly, a good part of the entire Air Force supply system would become a thing of the past. Base-level functions could easily be reduced to fueling, munitions loading, launching, and recovery operations.

Let me give you some very conservative dollar savings that we already know, for a fact, would result from such reliability. Suppose we could do away with aircraft and missile spares and Class 4 modifications, and reduce support equipment by 75 percent. That alone would represent a savings of over $6 billion in the fiscal 1984 Air Force budget alone, and

almost $8.25 billion in the fiscal 1985 budget.

Then there would be substantial savings in operations and maintenance costs, about $7.5 billion this year, and almost $9.5 billion in fiscal 1985. These savings, when coupled with additional savings in civilian logistics personnel, could easily free 20 percent of the entire Air Force budget to be used in more productive and meaningful ways.

Over a 30-year weapon system life-cycle period, assuming just a 5 percent inflation rate, the savings would amount to $1.238 trillion. Let me remind you that this is a very conservative estimate. It doesn't take into account the costs of military personnel, construction, research, development, test, evaluation, and the wide spectrum of miscellaneous procurement expenses that result because our weapon systems are unreliable.

What we've been talking about here assumes almost totally reliable systems, which, although possible and no doubt inevitable in the future, are certainly not in the cards *in* the near term. But what about the cost savings for smaller, more readily achievable reliability improvements? What impact would more modest mean time between failures improvements have on defense spending?

Fewer Spares Needed

If you were to look at a composite of our fighter aircraft, and model, say, their spares requirements against mean time between failures, this is what you'd find. For a 25 percent improvement in MTBF, perhaps from 500 hours to 625 hours, you could reduce the spares requirement almost 40 percent and still maintain the same aircraft availability. If you could double the present MTBF, you would eliminate almost 80 percent of the present spares requirement.

Think about that. Think about the incredible savings in dollars this would lead to. Think about how much more affordable our national defense would be. Think about how much more prepared we would be to defend our vital interests anywhere in the world. Think about the enhanced deterrent value our forces would have. And think about this: Much of what I've been talking about is well within the realm of possibility and is well within our reach today.

You know this even better than I. You're in the space business. By its very nature, the space business is the reliability business. You know as well as I that the same technology that allows us to maintain missiles on alert with verifiable reliability, or blast satellites into a very stressful environment with no failures and no need for calibration, is there waiting for us now. We need only step up to the problem, pay the investment costs up front, and take advantage of the great leverage increased reliability can give us.

The Burden of Unreliable Systems

Given the technology we now have available, it makes a great deal of sense that we do so. In time, the changes I'm talking about are inevitable because the lack of system reliability so greviously drains our national resources, burdens our economy, and limits our military security.

Historically, whenever such serious problems have existed, and whenever the technology has become available to solve them, man, in time, has naturally exploited this technology and solved those problems. My chief concern now, however, is that considering the dangers we face, and the vulnerabilities we have, there may not be time for nature to take its course. Speeding up this natural process will require a courageous and concerted effort on the part of private enterprise, that element of the defense equation on which our democracy relies for innovative solutions to difficult challenges.

Increased Reliability Inevitable

There will no doubt be a great deal of pain in casting aside our outdated mind-sets. There always is. There really is no other choice, given the challenges we face, and the payback, in terms of enhanced security, that greater system reliability can provide. That's why I firmly believe that increased reliability is not only inevitable—it's also where the opportunity of tomorrow now lies. Not only is there the opportunity for greater business profit, but there is also the opportunity for a safer, more secure world. ■

Nuts and Bolts

(Continued from page 6)

the initiatives we have been discussing.

Can we expect an end to the spare-parts horror stories? No. The pricing of spare parts is only a small part of spare-parts procurement, which includes provisioning, replenishment, breakout, parts standardization, stockage policy, inventory levels, competition, technical and proprietary data, and procurement strategies.[4] Spare-parts procurement, in turn, is only a part of the overall spare-parts acquisition process, which also includes requirements determination and the authorization appropriation, and budgeting processes.

Recently, we have seen horror stories about the Air Force disposing of spare parts while simultaneously buying identical items. There may be hundreds, even thousands, of potential horror stories waiting to be uncovered as we attempt to improve spare-parts management and acquisition processes.

What seems to have been overlooked in most of the articles concerning spare parts is that the people involved are generally sincere, honest, hardworking, and taxpaying citizens. Moreover, they are as concerned about national defense and the efficient use of their tax dollars as are all Americans. ■

Notes

1. Department of Defense, *Report to Congress on Acquisition and Management of Spare Parts*, June 1, 1984, Table 1, Enclosure 1.
2. Office of Federal Procurement Policy, *Review of the Spare Parts Procurement Practices of the Department of Defense* (a report to the Congress), June 1984, pp. 36–37.
3. "Administration Claims Good Year for Small Business," *Federal Contracts Reports*, Volume 41, April 16, 1983, p. 691, Bureau of National Affairs, Washington, D.C.
4. Major General Joseph H. Connolly, USAF, "Spare Parts Procurement Can Be Improved," *National Defense*, April 1984, p. 21.

COMPUTER TECHNOLOGY

CATM Lives!

A Focus on Computer-Aided Technical Management in Defense Systems Acquisition

Wilbur V. Arnold
Paul J. McIlvaine
Eric P. Taylor

Photo courtesy of Auto-trol Technology

Computer aid is everywhere—in our personal lives, in the commercial world, and in the Department of Defense (DOD). Proliferation of applications, coupled with productivity, has encouraged development of fantastic computing capabilities that are now even entering the (human-like) intelligence field. The DOD is encouraging application of this capability through a variety of incentives and funded programs. Industry, in response to business incentives for productivity improvements, has led the way in computer-aided manufacturing (CAM) and computer-aided design (CAD). The DOD has stimulated computer application to other pieces of system acquisition technical management—systems engineering, testing, cost, and logistics. Whereas industry has proceeded to a "second generation" linkage of CAD and CAM through a common data base, a common real time linkage of the other pieces of technical management (cost, logistics, test) has not been established. What follows is the development of a concept for an integrated system of computer-aided technical management (CATM).

What's Happening in CAM?

Manufacturing tasks are typically repetitive and labor intensive. Manufacturing costs of a weapon are generally three times greater than engineering costs alone. Thus, emphasis on productivity has been generally directed at the manufacturing process. The net result is that manufacturing organizations in the aerospace industry have been the force for acquiring and implementing computer-aided systems.

"CAD/CAM" is the most active manufacturing initiative today, ahead of FMS (flexible machining systems), and group technology. An accurate in-depth understanding of CAD/CAM, however, has fallen behind the contagious popularity of the term. It really means integrated computer-aided design and manufacture in the broadest sense of the word. Too many users have settled for a "stand alone" CAD or, worse yet, a small segment of CAD such as computer graphics. Similarly, some have seen CAM as N/C tools, while others have seen it as MRP (manufacturing resource planning, including material requirements). Fortunately, these people are now extending their thinking. They are looking to the high payout from the synergism of an integrated design and manufacturing system shown conceptually in Figure 2.

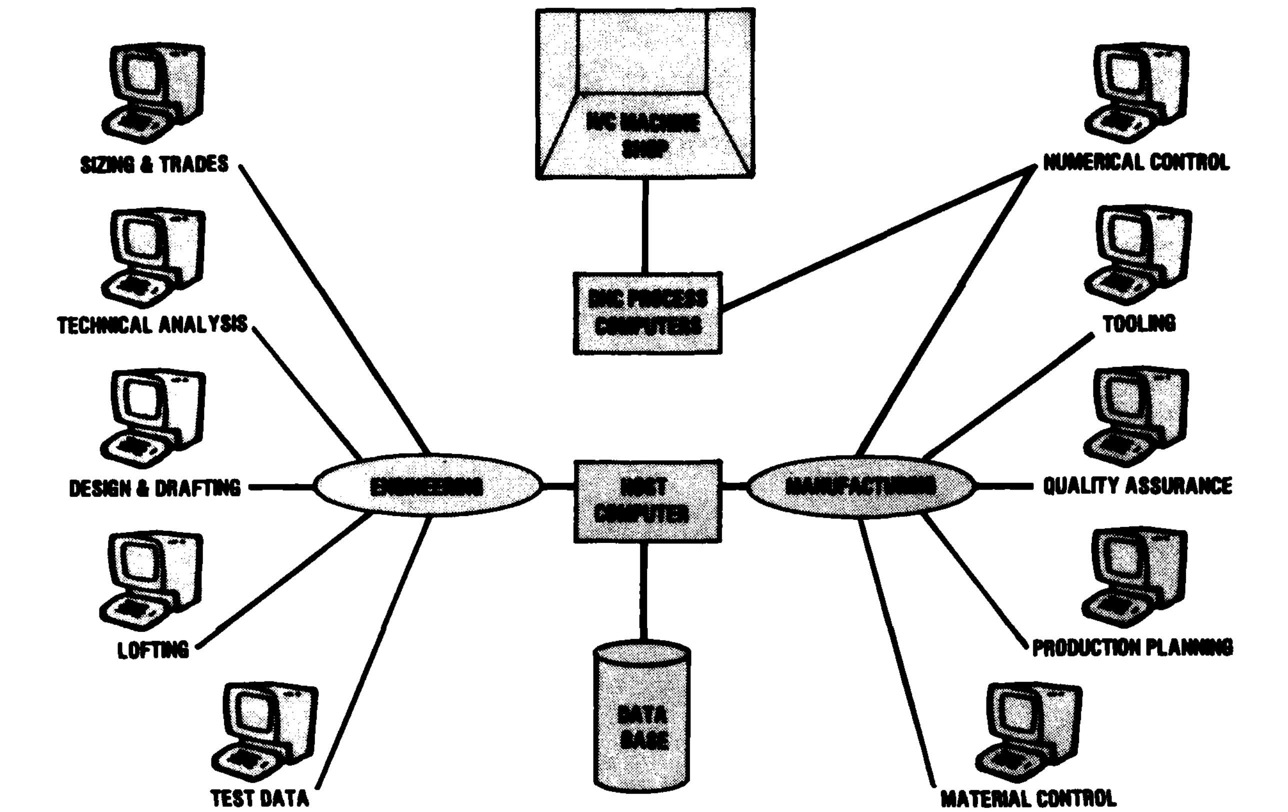
Figure 1. *Shown at the left is Computer-aided Design performed on an Advanced Roster Workstation (ARW) capable of three-dimensional formations with the touch of the key pad.*

(An important element of a computer-integrated manufacturing system is the business-information system, which serves the information needs of the entire business. Although not shown in Figure 2, it is shown later in the overall scheme presented as Figure 7.)

A data-base management system is another element of the computer-integrated manufacturing system. Data bases are powerful sets of software programs that control complex file

■ *The authors wish to recognize substantial contributions by Dan Dudas, Vice President, Lockheed-California Company.*

Figure 2. The Integrated CAD/CAM System



structure with a practical balance of integrity, security, resource costs, and ease of understanding. These were discussed and developed for 20 years, but only in the late 1970s did they become a practical reality. These software programs and files and the CAD/CAM inputs are no longer separable; they must function together in a smooth-running, total system. Together, these three (called computer-integrated manufacturing) integrate all of the manufacturing-related functions into one neutral monolithic computer system. This is going well beyond the traditional CAD/CAM concepts, and really extending the limits of today's systems.

The ultimate payoff of CAD/CAM will occur when geometry definition and other product information are defined and stored in a data base that can be accessed directly by manufacturing. The large variety and number of manufacturing operations can benefit in "real time" from this product definition. Other than in LSI circuit design, the industry hasn't advanced to this point. Advances have been somewhat impeded by adherence to traditional methods and the nature of the engineering/manufacturing interface. The compartmentalization of engineering and manufacturing functions has been somewhat irreverently described as a process whereby the engineer, having made the drawings for a new weapon, throws them over the transom into the manufacturing department, secure in the belief that it is merely routine to make the weapon and deliver it.

Real success has resulted from the introduction of computer systems with data bases shared by both engineering and manufacturing organizations. It has been demonstrated, in a very practical way, that if the engineering organization can define or describe a new system in terms of standardized computer language, that self-same computer language can be used directly by manufacturers in the creation of tooling, jigs, fixtures, and other means of production, as well as for quality-control functions and the operation of numerically controlled machines.

There are numerous other CAM applications. Among them are computer-aided process planning (CAPP) to standardize and optimize production methods by transferring some simple decision-making to the computer. Also, a very close cousin to CAM is computer-aided materiel

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planning and purchasing (CAMPP), which, once it is set up, eliminates much of the repetitive labor-intensive effort associated with these tasks. In the materiel planning and purchasing, the ultimate step in computer automation would be CAD-generated data in a centralized product-definition data base, which purchasing could access so that purchase planning and order writing could be accomplished automatically.

Virtually every major U.S. defense contractor is involved in modernization and productivity enhancement. In anticipation of the dramatic changes sweeping through the civilian defense establishment, the U.S. Air Force has stepped in and committed millions of dollars in programs like ICAM to bring order and consistency to the multibillion dollar, industry-wide automation effort. A similar effort in the electronics industry, entitled ECAM, is being sponsored by the U.S. Army with the support of a large industry coalition.

What's Happening in CAD?

As currently applied in the aerospace industry, first-generation CAD provides descriptive geometry on an interactive graphics terminal. This essentially allows the designer to shape/size/dimension a given part by using the computer. Figure 1 shows a designer at a CAD terminal. The CAD is currently moving into the second generation of its evolution. This generation adds three-dimensional oriented methodologies to provide visualization that facilitates the design effort. The third generation of CAD will encompass three-dimensional physical part modeling along with the analysis and simulation tools to allow the designer to "stress and test" the design before finalization—even to the point of precluding the need for hard mockups.

Figure 3 illustrates the interrelationship of conceptual design, preliminary design, and production design. The shaded area through the middle is currently accomplished through first-generation CAD. As CAD moves into the second and third generations, the unshaded tasks will be accomplished "real time" through CAD and the associated computer-aided design analysis.

The CAD has shown impressive payoffs in productivity when compared to manual methods. Tests were conducted at Northrop and Lockheed to compare the productivity of manual versus computer-aided design. These results are shown in Figure 4. Among the reasons for this enhanced productivity are: Complex constructions can be done faster with a computer; repetitive construction entities do not have to be redrawn but can be instantaneously called from storage; geometry constructions are performed by the computer and do not have to be calculated; and the concentration of a designer on the CRT in an interactive mode is more intense than the designer is able to sustain on the drawing board.

Even higher productivity is expected through use of larger data bases to support designs from commonly used design information, with families of drawings created from layouts and assembly details derived from the same geometric data base, and with computer accuracy avoiding design errors in motion clearances and tolerances. In addition to improving the development of drawings, the automatic calculation and display of CAD are useful and effective as design aids for determining section properties, weights, volume, finite surface configurations, etc. Use of CAD graphics, to assist engineering analyses, generates fewer mistakes in the complex manipulation of geometric data.

Results in the aircraft industry indicate that CAD surface configuration definition for new aircraft developments has resulted in labor-hour reductions of 80 percent and span-time reductions of 50 percent. Further, benefits are dramatic in stress analysis where a large amount of time has been required to prepare and correct geometric input data. In aircraft stress analysis, manual generation comprises 90 percent of the analysis effort when geometric data is transformed from drawings into computer inputs. A comparison of the manual and CAD methods showed a labor-hours saving of 50 percent for a relatively simple structure. Even more dramatic savings will result for more complicated parts.

It is the development of structural elements that often paces weapon schedules. Requirements for high strength, low weight, and precise dimensions place heavy demands on effective designs, fabrication planning, and manufacturing process optimization. The CAD and CAM offer the best solution to this problem by significant reductions in engineering and manufacturing planning/tooling flow-times on critical tasks. Current evidence points to reductions in flow-times of more than 50 percent. The CAD also demonstrated a greater potential for reducing programming time for parts fabricated on 3-5 axis machines. The time planned to coordinate, tool proof, and produce an NC-machined part has been cut in half. A non-quantifiable but equally important benefit of CAD is that the designer can spend more time thinking about the technical problem and less time on mundane measuring, calculation, coding, and data-preparation tasks. Among those saving significant design time and exploiting CAD's utility is modeling the man-machine interface as shown in Figure 5. Also, the designer can immediately review full-size contour drawings on a CRT, resulting in significant savings by avoiding the time required for inputing curve-fitting programs. The continuity of the interactive, iterative process allows many more trials to be made while eliminating time required for manually coding each new trial.

What's Happening in Computer-Aided Test?

Comprehensive test activity is fundamental to an effective design and manufacturing process. From the evaluation of initial design concepts to the physical verification of a manufactured part, some method of measurement is necessary. The evolution of computer technology in general, and CAD/CAM in particular, is providing an enhanced capability to plan and conduct an integrated test program.

General computer capabilities are increasing our capability in test management by providing automated support in areas such as:

—Planning and scheduling;
—Support equipment accounting and tracking;
—Personnel support level estimating;

Figure 3. Computer-Aided Design

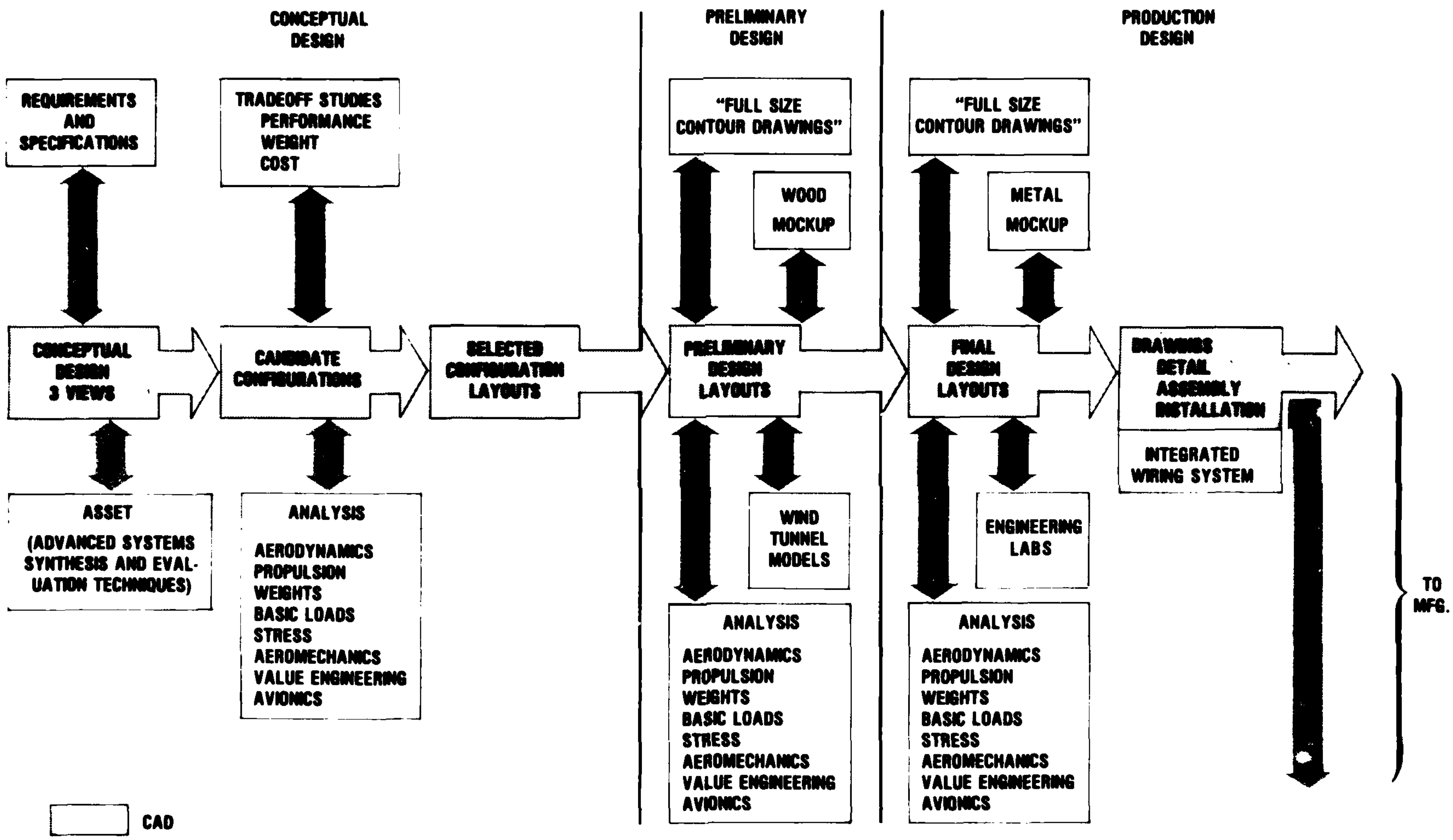
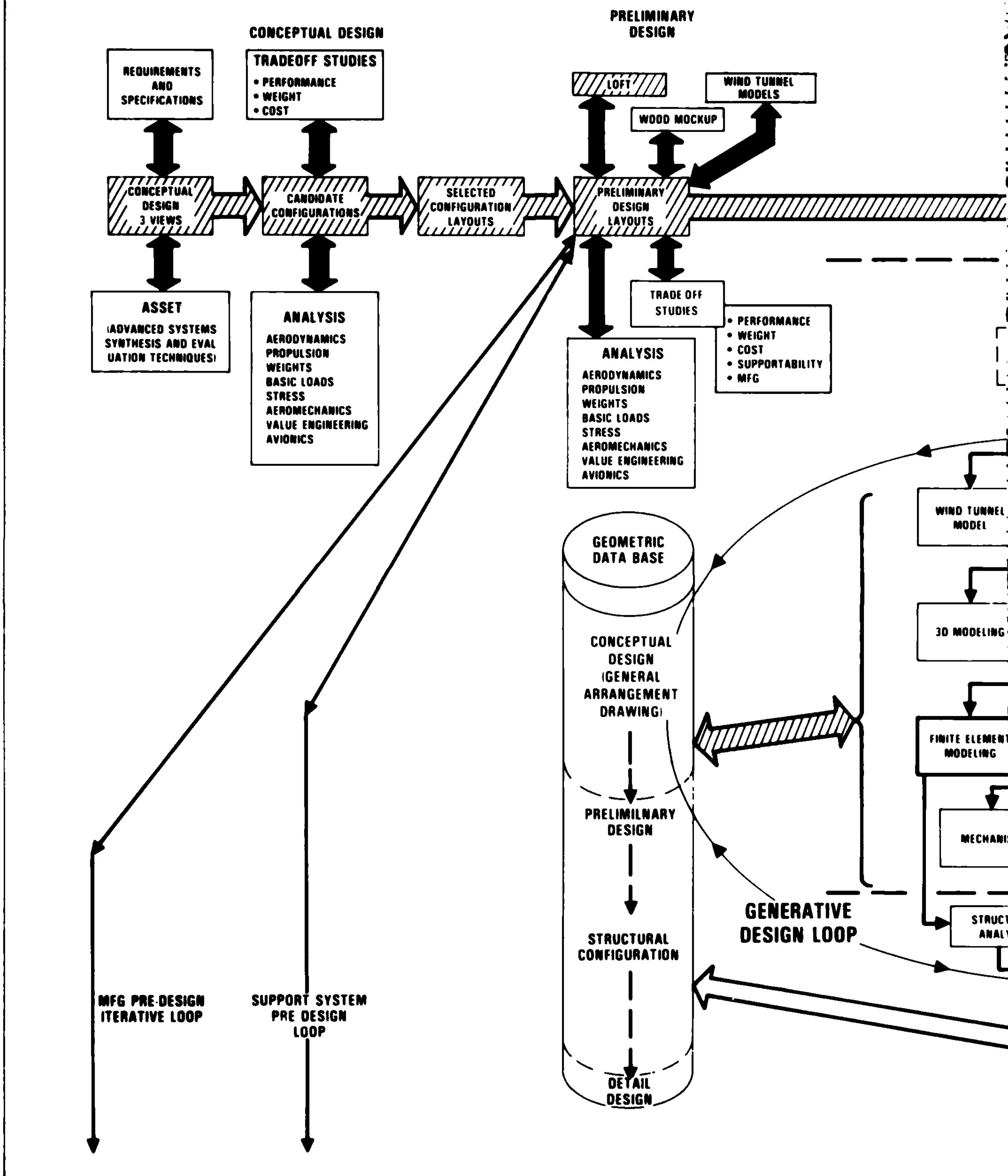


Figure 4. Productivity Comparison Manual Versus Computer-Aided Design

TYPE	DRAWING DESCRIPTION	MANUAL: HOURS	MANUAL: ESTIMATED	MANUAL: ACTUAL	CRT (HOURS) NORMALIZED	PRODUCTIVITY MEASURED	OPERATOR: NORTHROP	OPERATOR: LOCKHEED	COMMENTS
ADVANCED DESIGN LAYOUTS	GUN INSTALLATION	28	X	X	27	105/1	X		CADCAM EXTENDED WORK ALREADY STARTED MANUALLY A CRITICAL DIMENSION MISTAKE WAS FOUND
	GUN INSTALLATION (LAYOUT & MODIFICATION)	50	X	X	38	13/1	X		
	% VANE (LAYOUT & DETAILED DRAWING)	140			112	125/1	X		GUN MOVEMENT WAS VISUALIZED SOME LAYOUT CONSTRUCTED ENTITIES WERE CALLED FORTH FROM COMPUTER FOR DETAILED DRAWING
MECHANICAL INSTALLATIONS	F-5 RUDDER PEDAL MECHANISM	32	X		80	4/1	X		MULTIPLE VIEWS SHOWING THE MECHANISM IN DIFFERENT POSITIONS ARE USEFUL IN FINDING ERRORS AND UNDERSTANDING OPERATION AND LIMITATION
	F-5 SPRING	16	X		19	85/1	X		
	F-5 TORQUE TUBE - RUDDER	12	X		21	5/1	X		PRODUCTION DRAWING WAS RELEASED
	F-5 LANDING GEAR - GEOMETRY	50	X		80	6/1	X		MOTION IS ACCURATELY DEPICTED DURING GEAR EXTENSION
STRUCTURAL LAYOUTS	F-5 CHAFF DISPENSER	50		X	76	65/1		X	SHOWED THAT IT WAS POSSIBLE TO PERFORM LAYOUTS
	F-5 ENVIRONMENTAL CONTROL SYSTEM COMPARTMENT	80		X	107	75/1	X		
DETAILS	F-5 GUN GAS DEFLECTOR FITTING	96		X	83	115/1	X		NO SYMMETRY OR REPETITIVE ENTITIES
	F-5 SPIN CHUTE TEST FAIRING	37		X	37	10/1		X	IT TOOK 25 HOURS TO COPY THE DRAWING
	F-5 SPIN CHUTE TEST FAIRING (MODIF)	6	X		035	17/1		X	MOLD LINE CHANGE WAS MADE
ELECTRICAL SCHEMATIC	F-5 ELECTRICAL WIRING DIAGRAM (VOR/ILS RADIO)	8			12	65/1		X	
NUMERIC CONTROL	747 3 AXIS FRAME	25		X	100	4/1	X		

Figure6. Computer-Aided Product Definition

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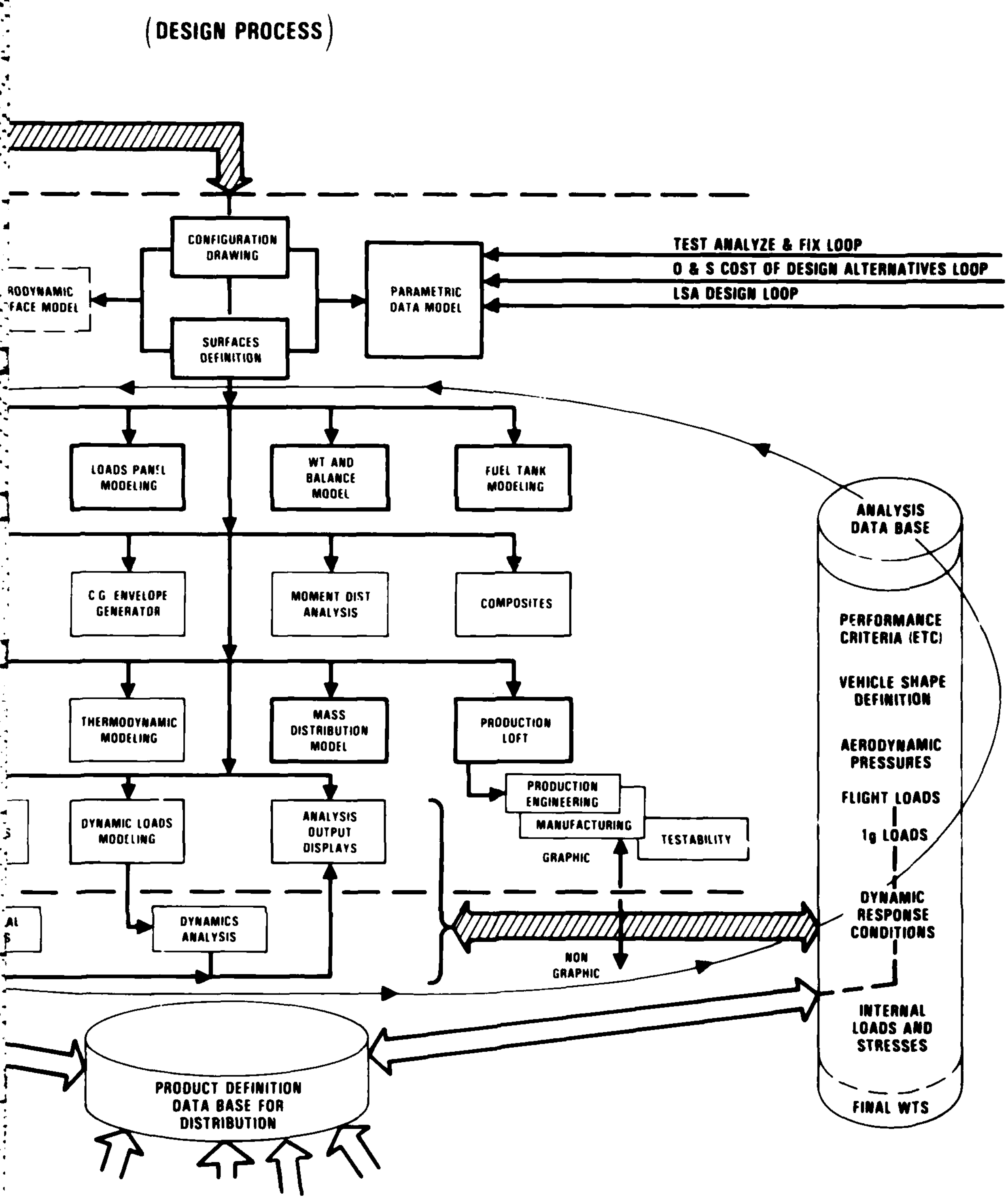
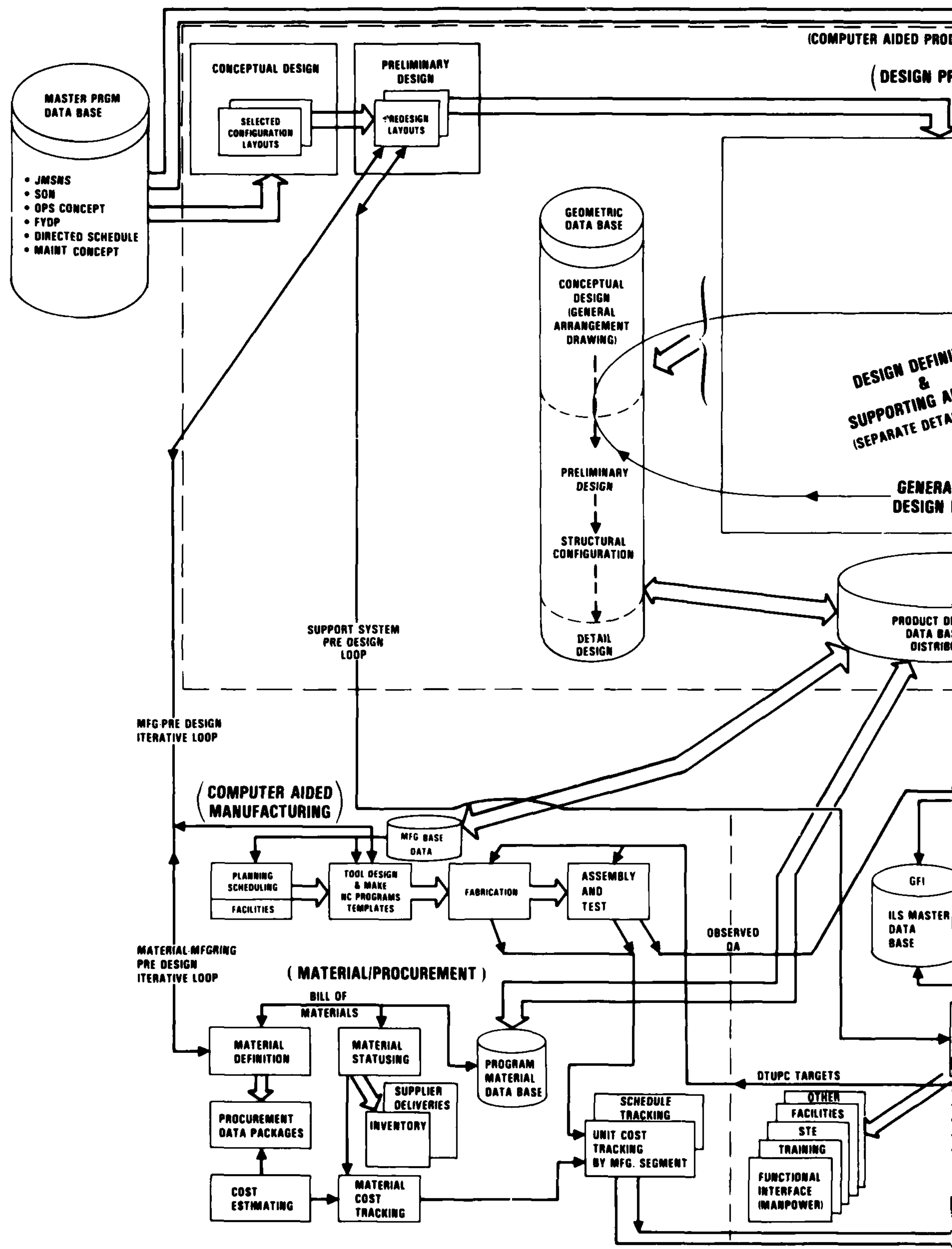
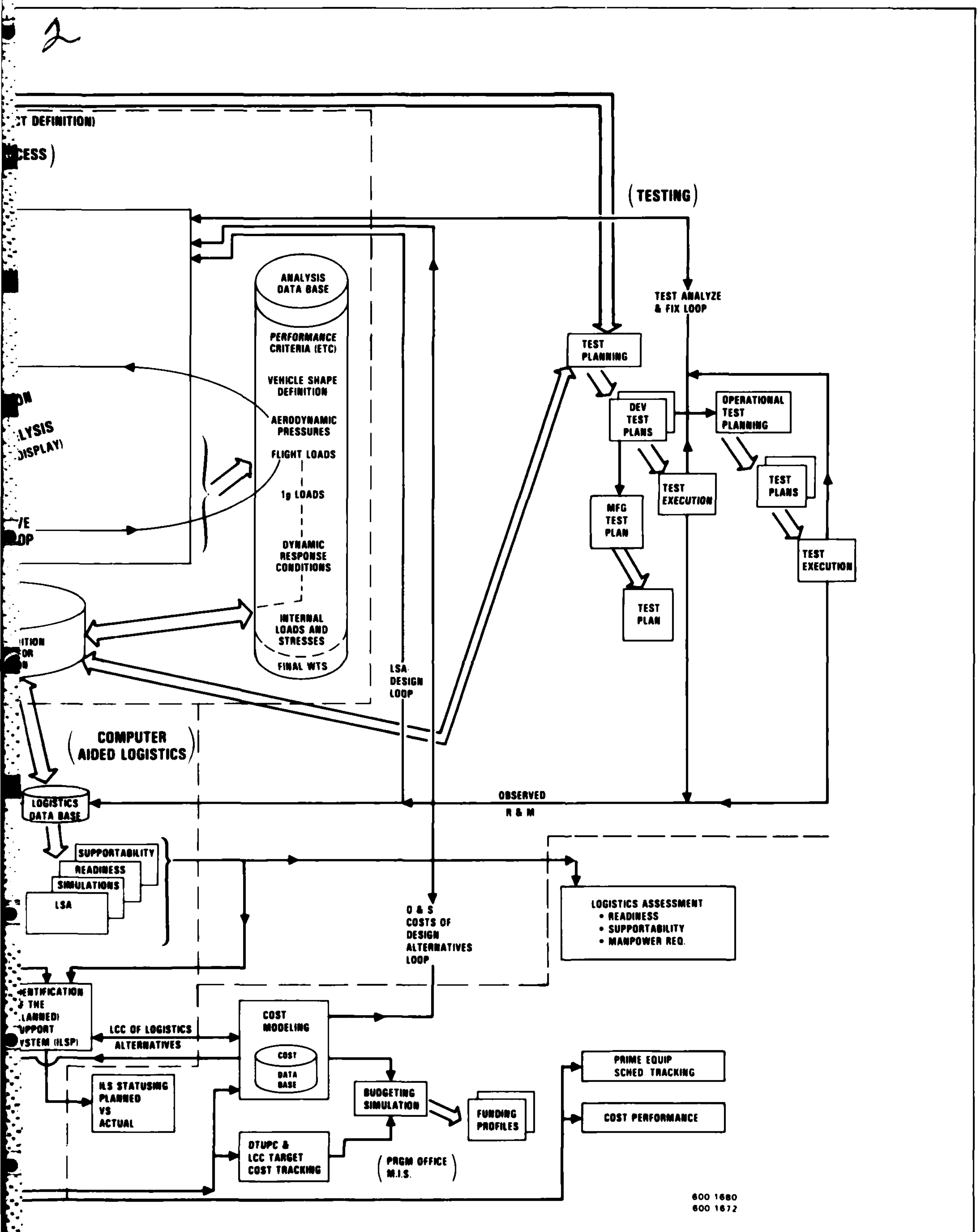

(DESIGN PROCESS)
CONFIGURATION DRAWING
SURFACES DEFINITION
PARAMETRIC DATA MODEL
TEST ANALYZE & FIX LOOP
O & S COST OF DESIGN ALTERNATIVES LOOP
LSA DESIGN LOOP
LOADS PANEL MODELING
WT AND BALANCE MODEL
FUEL TANK MODELING
C G ENVELOPE GENERATOR
MOMENT DIST ANALYSIS
COMPOSITES
THERMODYNAMIC MODELING
MASS DISTRIBUTION MODEL
PRODUCTION LOFT
PRODUCTION ENGINEERING
MANUFACTURING
TESTABILITY
DYNAMIC LOADS MODELING
ANALYSIS OUTPUT DISPLAYS
DYNAMICS ANALYSIS
GRAPHIC
NON GRAPHIC
ANALYSIS DATA BASE
PERFORMANCE CRITERIA (ETC)
VEHICLE SHAPE DEFINITION
AERODYNAMIC PRESSURES
FLIGHT LOADS
1g LOADS
DYNAMIC RESPONSE CONDITIONS
INTERNAL LOADS AND STRESSES
FINAL WTS
PRODUCT DEFINITION DATA BASE FOR DISTRIBUTION

Figure 7. Computer-Aided Technical Management





2
T DEFINITION)
CESS)
(TESTING)
ANALYSIS DATA BASE
PERFORMANCE CRITERIA (ETC)
VEHICLE SHAPE DEFINITION
AERODYNAMIC PRESSURES
FLIGHT LOADS
1g LOADS
DYNAMIC RESPONSE CONDITIONS
INTERNAL LOADS AND STRESSES
FINAL WTS
LYSIS
DISPLAY)
TEST ANALYZE & FIX LOOP
TEST PLANNING
DEV TEST PLANS
OPERATIONAL TEST PLANNING
TEST EXECUTION
TEST PLANS
MFG TEST PLAN
TEST EXECUTION
TEST PLAN
LSA DESIGN LOOP
(COMPUTER AIDED LOGISTICS)
LOGISTICS DATA BASE
OBSERVED R & M
SUPPORTABILITY
READINESS
SIMULATIONS
LSA
O & S COSTS OF DESIGN ALTERNATIVES LOOP
LOGISTICS ASSESSMENT
• READINESS
• SUPPORTABILITY
• MANPOWER REQ.
ENTIFICATION OF THE PLANNED SUPPORT SYSTEM (ILSP)
LCC OF LOGISTICS ALTERNATIVES
COST MODELING
COST DATA BASE
ILS STATUSING PLANNED VS ACTUAL
BUDGETING SIMULATION
FUNDING PROFILES
PRIME EQUIP SCHED. TRACKING
COST PERFORMANCE
DTUPC & LCC TARGET COST TRACKING
(PRGM OFFICE M.I.S.)
600 1680
600 1672

—GFE status accounting; and
—Test program documentation.

The CAD has enhanced the early design phase by using test simulations. This capability is expanded during the system development phase through hardware in-the-loop simulation to verify earlier parametric analysis and correlation with other test data. In addition, engineering, acceptance, and qualification testing have been greatly facilitated by computer automation. With the increasing complexity of equipment, especially electronics, it would be nearly physically impossible to evaluate all test points in a timely fashion. Computer-directed tests conduct these activities in minutes and provide hardcopy printout without need for an individual to read meters and transcribe the data. Finally, computer-aided technology is assisting in evaluating the interfaces between hardware and software with system "end-to-end" testing.

What's Happening to Computer-Aided Cost (CAC)?

The cost area has used computers for as long as they have existed. Their use was associated with various cost-estimating techniques and models, or with classic "after the fact" accounting activities, to document what happened. Computers also were applied to the automated formatting and manipulating of cost information to generate reports, documents, charts, and tables. The capability was expanded to document what is happening by tracking costs through systems like C/SCSC (cost/schedule control system criteria).

Although cost-predictive capabilities are limited, the ability to track costs has increased to the point where it is almost real time. As an example, engineering managers have labor actuals within 2 work days of the close-out date. In most cases, this is routinely tracked on a weekly basis so that variance from plan can be identified early and corrective actions initiated before the variance becomes large.

The future of CAC will be governed by executive decisions relating CAD/CAM to the central management information system (MIS). At present, corporations do not have integrated MIS and there does not appear to be any senior management push in this direction. Without integration, the ability to conduct "what if" exercises will be inhibited by the amount of human intervention required between the different systems.

The real payoff in CAC will come when life-cycle cost and design-to-cost estimations are linked on a real time basis to CAD. This will enable cost to be accurately reflected as a design criteria, with the cost implications of a given design portrayed in "real time" to the designer. This will require the development of algorithms to link cost to design.

What's Happening in Computer-Aided Logistics (CAL)?

A literature search has identified numerous computer applications in the logistics process. Most current computer-aided logistics activities fall into two categories. These are modeling (simulated logistics alterations, estimated life-cycle costs, predictability level of repair requirement, etc.) and accounting (invoices, utilization trees, and checking status against plans, etc.). Meanwhile, CAD is being used as the product-definition basis for some computer-aided logistics tasks. Among these tasks are: determining the hierarchy of logistics and items that are affected by a change to a given part number (F16); evaluating B-1B supportability and defining B-1 support requirements; preparing tech orders from the digitized CAD data base, and computer-based intermediate-level maintenance aides. Additionally, the AMRAAM uses computers and laser printers to automate the input to LSAR sheets. The Hughes Support Systems Division uses decision-support analytical tools that tie life-cycle cost considerations into computer-aided design on electronics systems. The Lockheed Shipbuilding Company uses computer-aided maintenance analysis on the LSD 41. The General Electric Engine Division uses computer-based engine simulation to predict aircraft engine logistics requirements.

These applications have greatly facilitated ILS effort on weapons programs. However, the big payoff of CAL is still to come. This payoff will occur when logistics activities are linked on a real time basis to CAD, thereby allowing supportability to be reflected as a design criteria in the

Figure 5. *The COMBIMAN human figure and workspace can be projected on the screen of an IBM 2250 Graphic Display Terminal in an off-axis perspective view. The designer can interact directly with the computer through the terminal.*

Courtesy of IBM Corporation

design process. Although data-base management and network processing are available, there is a missing link. The missing link manifests itself in the need to develop and compile algorithms by weapon type, function, and subsystem, which link supportability to design. In effect, what must be developed is a qualitative and quantitative representation of supportability design to requirements (SDTRs). In addition to the need for SDTRs to effect the link between logistics and engineering, the SDTRs must be implemented through the logistics support analysis process as described in MIL-STD-1388A. To achieve this, computer automation must be applied to the LSA process to develop programs that address the repetitive aspects of LSA, to provide on-line interactive capability with design engineer to allow rapid data changes and data dissemination, to provide one central data base that serves all logistics elements, and to provide the capability to change support performance parameters and evaluate the effect on end-item supportability.

Computer-Aided Technical Management (CATM)

The systems design and acquisition process is clearly too specialized, too complicated, too detailed, and too dynamic to remain in a mode using manual methods. The increasing demands for improvements in linking functional disciplines (cost, test, logistics, manufacturing) to the design process call for a basis of linkage in a common area of interest; i.e., product definition throughout the life cycle. Figure 6 illustrates a conceptual approach for achieving this definition wherein feedback loops of other functions in the iterative process are shown.

Computers not only will perform many of the "functional" tasks, but they also offer significant assistance for a program manager in facing the total technical management (and ultimately program management) challenge of a program. Figure 7 is a conceptual arrangement for an automated system of technical management. Such a system would provide many benefi'- in the development of weapons sy.:.ems: (1) greatly enhance productivity by allowing functional disciplinary tasks, which depend on product definition, to be done in parallel as contrasted to the "in serial" process now used; (2) reduce the amount of paper generated in the interface between functional disciplines; (3) provide downstream functions (logistics, T&E) with tools to impact the design process and afford the long sought-after ability to balance operations and support considerations with performance and schedule objectives; (4) reduce errors and mistakes that inevitably occur due to an incompatible or untimely information interface between functional disciplines; and (5) reduce time required from concept exploration to fielding a fully supported system.

Conclusion

The big-picture problem for this computer-aided revolution is already well documented and accepted—lack of technically skilled workers. A long-term solution is already in being—a new generation of workers being raised in the computer-aided environment. But must we wait a generation to gain the potential efficiencies? Worst of all, needed productivity will be lost if we don't focus the computer system developments on the right issues. Designers must be *trained to interact real time with all* the system functional disciplines. Users must be trained to interact with simulated demonstrations for design and testing purposes, utilize computer-generated mockups for quicker design and analysis of support systems, and facilitate computer-aided design information transfer to support documentation. Managers must be trained to integrate the computer for maximum productivity through a total systems approach.

This goes beyond "get familiar with computers, touch a keyboard, generate a program." We're trying to provide a focus for the development of a CATM system, a focus needed not only to influence the application and design of functionally related networks, but also to stimulate thought and action about the personnel and training factors that will maximize the productivity of such a system.

Computer-aided design and computer-aided manufacturing are here to stay. But they are merely the first steps. Among tasks remaining to reach the mature integrated system are defining the input-output interfaces between the engineering module (which accomplishes the product definition) and the other technical modules; defining the feedback links between the modules; incorporating computer-aided technical performance measurement; incorporating computer-aided cost measurement; and enveloping computer-aided technical management in a program decision support system.

Computer productivity in developing and producing affordable and supportable weapons is the thrust of the 1980s. The CAD, CAM, and CAL have taken the first steps. The advancing computer and data systems technologies (data-base management, data-distributed networks, distributed processing) afford the means to move toward a truly integrated system with its attendant benefits. But without a cultural change in the way the program functional disciplines interrelate and conduct their activities, true progress will be impeded.

We must provide conceptual focus, such as computer-aided technical management (Figure 7), for integrating technical-management tools and then get on with the necessary developments. ■

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The Department of Defense Acquisition Improvement Program, established by then Deputy Secretary of Defense Frank Carlucci in 1981, included "Increase Competition" as a key action. Much of the interest in encouraging competition has focused on the prime contractors. However, there is increasing interest in the benefits of competition at the subcontractor level.

In the 1983 law extending the Office of Federal Procurement Policy through fiscal year 1987, Congress has required a study of subcontractor competition during 1984 (Section 17 of Public Law 98-191).[1] The Deputy Secretary of Defense recently issued a memorandum to secretaries of the military departments emphasizing the potential for increased competition at the subcontract level.[2] The military departments already had begun to examine the issue of subcontractor competition.[3]

In this paper I introduce four constraints to consider when developing a subcontractor competition strategy, and present specific recommendations for implemention.

Background

Most prime contractors make extensive use of subcontractors. Air Force experience indicates that 40-70 percent of prime-contractor effort is contracted out.[4] Thus, subcontracting by prime contractors provides a significant opportunity to further implement the Department of Defense Acquisition Improvement Program.

Subcontractors often provide a substantial amount of fabrication work, and design and testing of their components. Most subcontractors typically contract-out some of their work, resulting in a multitiered subcontract organization. For example, an aircraft manufacturer may subcontract out its landing-gear system (first-tier subcontractor). This contractor may in turn contract out the manufacture of forging dies (second tier). The forging-die supplier would purchase the die material from a speciality-steel producer (third tier). Most of these subcontractors have a mix of military and commercial business. Taken together, subcontractors comprise a substantial proportion of our industrial base.

Two Types of Subcontractors

In general, there are two types of subcontractors: (A) suppliers of standard materials, services, equipments, and products; and (B) suppliers of proprietary materials, services, equipments, and products.

The main distinguishing characteristic is that Type-B subcontractors perform substantial value-added functions, such as engineering design, test, unique manufacturing methods, etc.

Type-B subcontractors tend to specialize in particular subsystems. They generally compete on the basis of innovation, while Type-A subcontractors tend to compete on the basis of price.

During the systems acquisition process the government generally allows the prime contractor to select and establish a business relationship with the subcontractors with little or no interference. Prime contractors are responsible for the performance of their subcontractors. Major subcontractors are approved by the government, but rarely does that approval extend to the second tier or beyond. Only after the breakout of major subsystems and the procurement of spare parts does a direct business relationship exist between the government and the subcontractor.

Competition at Subcontractor Level

Some key issues that arise when considering competition at the subcontractor level are: How can the government encourage competition even when no direct relationship exists? Does the competition strategy need to be tailored to the type of contractor? How can competition be structured to incentivize innovation as well as reduce the price? Is enhanced competition always desirable? What is the effect of competition on program risk?

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Prime contractors generally ensure that competition exists at the subcontractor level. Type-A subcontractors are regularly recompeted; their particular goods and services lend themselves to competition. Type-B subcontractors are usually competed during the system-development phase, with the award made on the basis of technical performance and price. But, during the production phase, these contractors become essentially single or sole-source since competition would require additional design and qualification efforts by the prime contractor, and the prime is typically not funded for this type activity.

There is no comprehensive source of data available to quantitatively assess the extent of subcontractor competition. However, the analysis of data obtained during the government's contractor system purchasing review (CSPR) at selected times at the prime contractors' facilities indicates that approximately 50 percent of first-tier subcontracts are awarded competitively.[5] No data exist for levels beyond the first tier.

The Type-A subcontractors who supply standard services and products experience constant competition since their items are relatively easy to recompete. Thus, their outlook is very short-term oriented with little incentive to undertake risk for long-term benefit, unless there are other compelling factors in the commercial marketplace.

Most prime contractors have firm rules limiting the amount of business a subcontractor could receive in a particular area; for example, a Type-A supplier could not receive more than 60 percent of the available business for widget "X." This rule prevents over-reliance on a particular supplier and keeps the threat of competition real. But, it further reinforces the subcontractor's short-term outlook.

Unlike prime contractors, Type-B subcontractors pay for their development costs out of their profits since they usually are not in a position to win government research and development contracts, or to make extensive use of independent research and development funds to cost-share the develop-

ment activities. Invariably, the primes negotiate a firm, fixed-price contract with their subcontractors, even if the prime has a cost-plus or fixed-price incentive-fee contract.

Invariably, the primes negotiate a firm, fixed-price contract with their subcontractors, even if the prime has a cost-plus or fixed-price incentive-fee contract.

Thus, the subcontractors undertake substantial risk, particularly during the development phase. They, in essence, bet that their innovative approach will be selected for the production phase, and that their sole-source position will then allow them to recoup their investment and make a profit. Perhaps a crucial factor in the trend of many subcontractors becoming part of a conglomerate corporation is access to financial resources (capital) so that they can remain competitive.

Recommendations

Competition at the subcontractor level should be enhanced, but only after the establishment of a comprehensive strategy and the ability to tailor it to specific circumstances. The following recommendations will suggest constraints on developing the strategy, and will present some of the key elements of a strategy.

Constraints serve to establish limits on the scope of an issue. The following four constraints on subcontractor-competition strategy are suggested to provide realistic bounds for developing an effective strategy.

CONSTRAINT 1: Implementation of the strategy must not be manpower intensive on the part of the government or the contractors, including the subcontractors. The government procurement offices are already severely manpower constrained, and any additional effort in one area necessarily results in diminishing effort in some other essential area. Similarly, contractors already complain that the many rules, regulations, and reporting requirements required by government contracts are onerous and serve as disincentives for proposing on government contracts. It would be ironic if, in an attempt to increase subcontract competition, more subcontractors were driven from the defense marketplace.

CONSTRAINT 2: The government must not violate the privity of contract between the prime contractor and his subcontractors. The prime contractors must continue to retain full responsibility for their subcontractors, and, therefore, the government *must not undertake any action that* can be construed as compromising that position.

We have to look at the reliability of each system critical to the mission in terms of the length of the mission sortie.

CONSTRAINT 3: The competition should not be based only on the price of the instant contract. While focusing on price as the basis for the selection has the benefit of being fairly straightforward to measure, it may obscure and even preclude the true, long-lasting effects of competition, an enhanced industrial base, and improved products. And, DOD credibility in encouraging capital investment and innovation will be substantially diminished.

CONSTRAINT 4: The strategy developed to incentivize prime contractors to develop more competition among subcontractors should provide a smooth transition to a direct government-subcontractor relationship in the direct procurement of spares. Thus, the industrial base should be left healthy after the competition so that future logistics requirements could be satisfied with a choice of suppliers, as opposed to one marginal but, perhaps, low-cost supplier.

The competition strategy should be divided into several elements: understand the industrial base, propose various competition scenarios, evaluate the likely impact of these scenarios upon the industrial base, establish a competition strategy, and monitor/assess the results. The strategy would depend upon the acquisition phase that the weapon system is in. The following recommendations provide examples of how subcontractor-competition strategy could be developed and implemented.

Efforts to analyze the industrial base should be instituted. The Air Force "Blueprint for Tomorrow," which includes data from 30 subcontractors and suppliers, examined modernization goals that could be expected from various sectors of the industrial base, and analyzed incentives required by the industries to make necessary capital improvements. This understanding of the industrial base is essential if competition among the Type-B subcontractors is to be structured properly.

The prime contractors should normally be directed to compete the Type-A subcontractors, particularly if they provide similar products and services to the commercial sector. The prime would not need additional incentive to compete the Type-A subcontractors, who are allowed to apply their overhead and profit rates on the value of the subcontract.

The prime contractors could be further incentivized to structure meaningful competition among Type-B subcontractors by using award fees to include analysis of the industrial base, competition strategy and plan, and implementation.

During the development phase the prime contractor should be incentivized to avoid becoming locked into one particular Type-B subcontractor providing a key subsystem. This might require additional government funds to pay for developments at two subcontractors. However, this approach would reduce risk to subcontractors and make them more amenable to something other than a "winner take all" award during the production phase. It also would set the stage for the logistics community by providing multiple sources for high-dollar spare

parts. To the extent the government funds the development effort, the issue of proprietary rights and data would decrease in intensity. However, this approach would cost more money up-front and would demand more attention by the prime contractor. Thus, the government must carefully evaluate the long-term benefit of this approach, and weigh it against cost. The production readiness review (PRR), conducted before the production go-ahead decision, should emphasize the necessity of the prime contractor's internal management system being geared to competition in awarding subcontracts.

Sudden establishment of subcontractor competition during the production phase can be a disincentive to the industry unless it is carefully done. The affected subcontractors probably would view the effort as a heavy-handed attempt to erode their profit margins, thereby stifling innovation and capital investments. Qualifying another Type-B subcontractor could be costly. Some redesign of the system can be required of the prime contractor to accommodate the alternate vendor's design. Qualification costs can range from hundreds to hundreds of thousands of dollars. If the production run is long, needed technical improvements are required and have to be qualified; or, if the subcontractor is not performing satisfactorily, competition should be considered. In any event, the administrative contracting officer should emphasize subcontract competition during the periodic CSPR.

Additionally, the Industrial Modernization Improvement Program should flow down to both types of subcontractors. This program provides long-term incentives to contractors who improve productivity, efficiency, and capital investments to produce a lower-cost, quality product.

During the deployment phase, the service competition advocate must essentially assume the role that the prime contractor did during the production phase. If the system is still in production the competition advocate can obtain assistance in fostering competition from the service's program office and prime contractor. As before, competition among Type-A subcontractors is fairly straightforward, while competition among the Type-B subcontractors is difficult unless pre-planned. The distinction between Type-A and Type-B suppliers might get blurred as the weapon system becomes older and the "standard" technology becomes obsolete and increasingly unavailable. Thus, continuous updating of the industrial sector analysis is important to the logistics community.

Summary

With current high-level interest in the Congress and in the Department of Defense on increasing subcontractor competition, it is inevitable that some action will be taken. Subcontractors perform a great deal of defense work and comprise a significant portion of the national industrial base, particularly high technology. Competition properly structured to encourage technical innovation and increased manufacturing productivity can quickly generate benefical, rippling effects into the commercial arena. Likewise, poorly structured competition can adversely affect the industrial base of the nation.

The subcontractor environment is complex and the application of competition must be judiciously and intelligently applied. It is truly an issue of major national concern.■

Notes

1. "OFPP Reauthorized," *Program Manager* January-February 1984, p. 53.
2. Deputy Secretary of Defense Memorandum for Secretaries of the Military Departments, "Increasing Subcontract Competition," March 12, 1984.
3. Wayne V. Zabel and Charles A. Correia, *Subcontract Competition*, U.S. Army Procurement Research Office Report 82-11, November 1982; "Program Manager Talks to the Navy's New Competition Advocate General," *Program Manager*, September-October 1983, pp. 15-19. Thomas D. Fiorino, Colonel, USAF, Presentation before American Defense Preparedness Association Profitability and Resource Management Conference, Arlington, Va., April 18, 1984.
4. Fiorino.
5. Zabel and Correia, *op cit*, p. 21, p. 7.

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FINANCE

Initial Support Funding

The Program Manager's Ability to Field a Supported System Requires His Visibility and Control of Certain Funds Currently Beyond His Grasp.

The Acquisition Improvement Program (AIP), first established in April of 1981, is completing its third year of action. Also known as the Carlucci Initiatives, the AIP originally consisted of 32 inititatives designed to improve the management of major system acquisition. Most of the initiatives were either completed or consolidated by the succeeding Deputy Secretary of Defense in May 1983.

One of the DEPSECDEF-approved and consolidated initiatives is Improved Support and Readiness. The AIP Initiative 30, "Management of Support Funding for Selected New Systems," is the backbone of the consolidated initiative. The original objective of Initiative 30 was to have the Office of the Secretary of Defense and the services improve the visibility to top management of weapon system support resources throughout the PPBS cycle, and to increase the involvement of program managers in programming, budgeting, and weapon system support funding execution; in other words, to ensure adequate support resources are planned and programmed. The initiative calls for the consolidated review of weapon system support funding as part of the program objective memorandum (POM) and budget reviews.

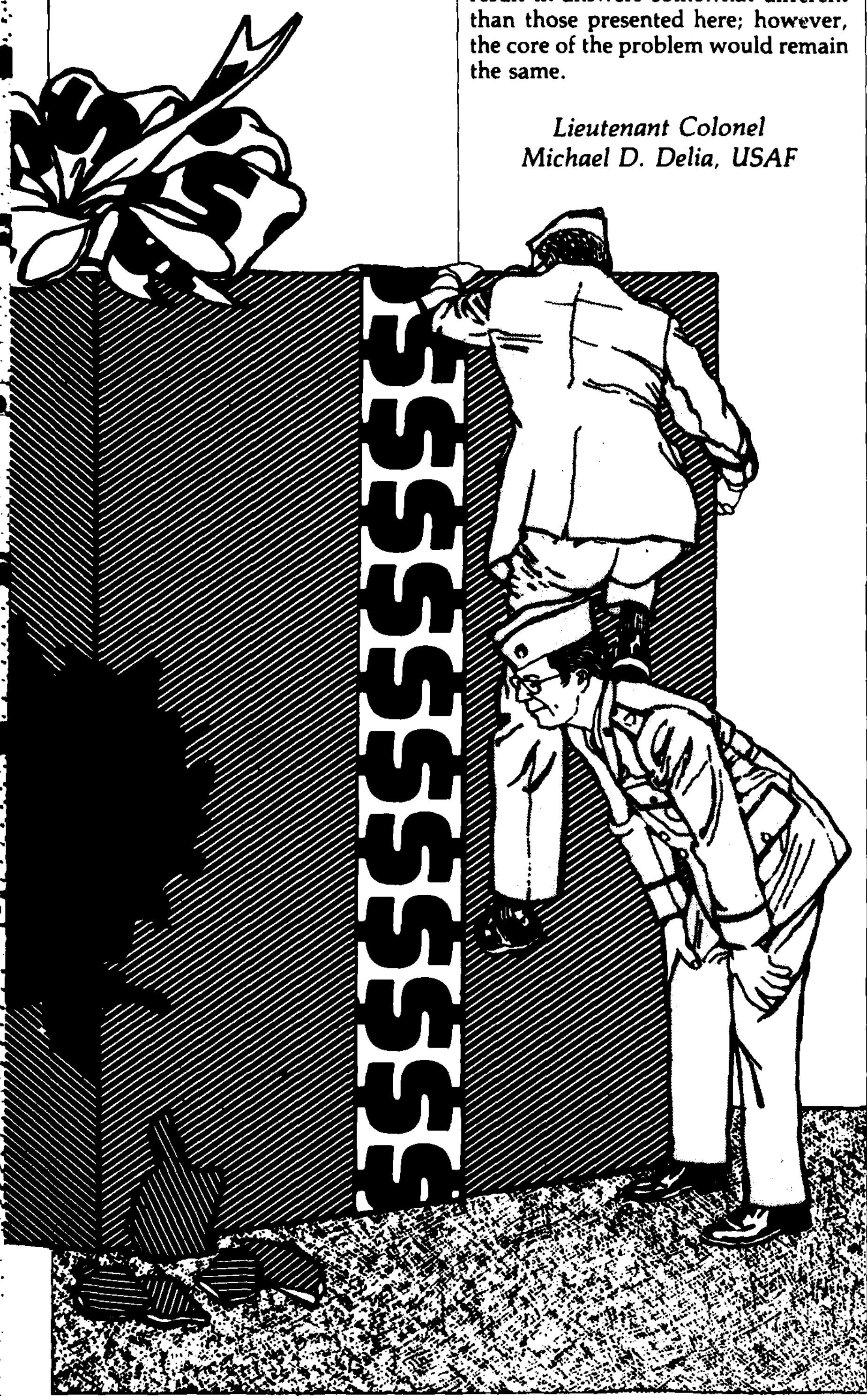
The current interpretation of this initiative is that program managers be given increased coordination, but not necessarily direct control, over support resources. This interpretation appears workable at first and capable of fulfilling the objective of the initiative. However, a closer look at what happens during the planning, programming, and budgeting system cycle at Headquarters, U.S. Air Force, and in the program office, reveals that the program manager, under the present system, does not have adequate visibility of support resources. In the following discussion, I will attempt to show that the program manager may easily be thwarted in his attempt to field a supported system. Some weapon support funds are controlled by service functional managers not responsible to the program manager and, often, budget-execution decisions are made without

coordination with the program manager, and without visibility of the impact on system support and readiness.

Discussion

How does the Office of the Secretary of Defense and the Air Force plan to implement this initiative? What are current Air Force practices that make implementation difficult? What has happened in the past 2 years of trial implementation? A brief answer to these questions will help demonstrate the difficulty of fulfilling this initiative. An in-depth analysis of the support- and readiness-funds accounting, which is beyond the scope of this paper, is warranted and could result in answers somewhat different than those presented here; however, the core of the problem would remain the same.

Lieutenant Colonel
Michael D. Delia, USAF



Full implementation of Initiative 30 will eventually extend to all programs entering or in early production, including major programs, less-than-major programs, and major modifications. However, in an attempt to clear early obstacles and debug the process, the Office of the Secretary of Defense and the Air Force have agreed upon an implementation plan that will evolve to full-program reporting.

Nine Logistics Elements

The mechanical process described in the implementation plan provides for reporting the funding on nine logistics elements required to deliver a supported system; i.e., spares and repair parts, support and test equipment, training and training devices, publications and tech data, depot repair, contractor support, facilities, ILS management and analysis, and other support-related requirements. Presently, the Office of the Secretary of Defense and the Air Force have decided on nine weapon system programs to initiate the reporting system. The product is intended to give the program manager "visibility" to the total funds required to develop, procure, and deliver system support, and to serve as a single source of integrated logistic support (ILS) funding data for staff reviews at all echelons during program objective memorandum and budget exercises.

Contained in the total dollars reported for the nine elements are funds that are held in pooled- or common-accounts and controlled by functional managers; i.e., funds not attributable to a specific weapon system. This is where the Initiative 30 process begins to break down. For example, replenishment spares, contractor support, common support and test equipment, depot repair and other support are not contained in funding dedicated to a specific weapon system. This not only prevents the program manager from having some degree of control over the funds, but also prevents the program manager from having visibility into the total support funds available to his program.

The following table provides data on the programs being reported in the FY 86 POM. The data show the percentage of support funds designated to a specific weapon system vice support funds that are pooled.

Programs in the FY 86 POM

System*	Total Support Reported ($M)	Dedicated $ (M)	$ Not Dedicated to Specific System
A	149.0	104.8/70%	44.2/30%
B	25.8	10.7/41%	15.1/59%
C	592.8	344.1/58%	248.7/42%
D	89.2	71.1/80%	17.6/20%
E	248.5	226.6/91%	21.9/ 9%
F	25.6	9.6/37%	16.0/63%
G	119.6	99.2/83%	20.3/17%
Total	1250.5	NA	383.8/31%

*Two systems are not included because the data reported were not in sufficient detail to analyze.

A study of the programs being reviewed shows a range from a low of 9 percent uncontrolled dollars to a high of 63 percent, with the mean dollars uncontrolled being 31 percent. On average then, up to a third of the dollars the program manager is reporting as meeting his support requirements may not be there at all! Reports for the FY 85 program objective memorandum and budget estimate submission were similar.

During internal exercises to adjust the total Air Force program, the Air Staff will rearrange programs, give and take funds according to priorities, and plan a total Air Force program to fit the Office of the Secretary of Defense fiscal guidance. In theory, this takes place three times a year (program objective memorandum, budget estimate submission, and parts breakdown). In reality, this rearranging of program funds (research, development, test and evaluation, and procurement) is being done constantly. Whatever the impact of these additions and deletions of the procurement funds to a given weapon system program, it is usually known within a matter of hours by the program management office via the air staff program element monitor (PEM). This is not the case with common-suppport funds.

Common-Support Accounts

Let's look briefly at how the Air Staff treats the common-support accounts. The replenishment-spares account, for example, is built by the logistics functional managers in a bottoms-up approach from all weapon systems in the budget. But once the total amount is determined, all program funds lose their identity. This, matched with the fact that support accounts have historically been a source of funds to feed procurement accounts (within the same appropriation), begins to reveal the core of the problem. When cuts or additions are made in support accounts, they may be spread evenly across programs or they may be spread by priorities. The point is, seldom does the program manager have visibility into this pool of funds handled by logistics functional managers at Air Staff level, and never does he have control.

At this point we might digress to illustrate the severity of the situation. The commanders of the Air Force Systems Command (AFSC) and the Air Force Logistics Command (AFLC) have recently signed a memorandum of agreement (MOA) aimed at making the program manager responsible for delivering a "supported" versus a "supportable" system. The MOA is attempting to create a jointly-named (AFSC/AFLC) organization to enhance the program manager's chances of gaining the control and visibility to enable him to perform this task. Yet AFSC and AFLC cannot agree on the control or the accountability of those funds so vital to the support task, a good part of which are supposedly tracked and reported by Initiative 30.

■ *Lieutenant Colonel Delia is the Deputy Chief, Formulation and Analysis Division in the Office of the Deputy Chief of Staff for Research, Development and Acquisition, at the Pentagon. He is a graduate of PMC 84-1, and this "think piece" was written in partial fulfillment of the requirements of that course.*

Two Good Ideas

So what the Air Force has is two good ideas, Initiative 30 and the AFSC/AFLC MOA, that are built on a shaky foundation. The Air Force Systems Command (and hence the program manager) has the responsibility of consolidating, tracking, and assessing the adequacy of those support-resource funds over which the Air Force Logistics Command has control!

The proof of the existing problem lies in the difficulty of verifying the product received from the program office by the Air Staff prior to incorporation into the program objective memorandum or budget estimate submission. Those funds that are included in baselined accounts, such as initial spares and peculiar special test equipment, can be verified. However, those funds attributed to common accounts are attributed "by magic."

To back up the last statement, one only has to realize that the trial reports (nine systems), which show nearly 100 percent funded requirements, cannot represent Air Force known underfunding of the total replenishment spares account (closer to 60-70 percent funded). If, in fact, these nine programs are of such priority and visibility to be fully funded in support areas, then the remaining systems in the total Air Force program, which are not being reported, must be substantially underfunded in support elements. More specifically, program manager visibility into initial support and readiness in these remaining programs in nonexistent.

Conclusion

I have raised some significant questions concerning the program manager's ability to field a supported system, despite the fact he has this responsibility. Several simple facts fall out. The program manager does not have visibility into certain support funds as the accounting system is presently set up. With or without visibility, the program manager does not have control of those funds. Should the program manager, then, be held responsible for a supported system if

he does not have visibility and control over the initial support funds?

If the answer to this question is "yes," and I believe it must be if we are to maintain system readiness during deployment, we must recognize present accounting system limitations and be willing to accept change where possible. Functional managers (AFLC) must be willing to identify common funds with a weapon system in an auditable way.

In addition, some old perceptions have to be abolished, such as the assertion that program manager control of support funds would result in more technical enhancements ("bells and whistles") rather than in "fenced" support funds. His responsiblity for system readiness will force the program manager to consider the impacts of all trade-offs.

Some difficult decisions must be made at the top-management level if we are to realize enhanced system support and readiness. But the decisions, when made, can have a synergistic effect. A decision to identify and baseline all common funds, such as replenishment spares, could prevent the historical "stealing" from support accounts. True, this will reduce total program flexibility, but it will force the tough programmatic decisions that can help to solve the services' out-year affordability problems. Lower priority programs might then be cut in lieu of support accounts being reduced to skeletal proportions.

The program manager must maintain close liaison with the Air Staff for insight into support funds. The program manager must "fence" these funds once he receives them; that is, consider system support and readiness from the early phases of development through deployment.

The Air Force has made major strides in recent years to fit a credible program into a resource-constrained total obligation authority, but we have a long way to go if we are to exceed mere lip service to "Acquisition Logistics Upfront" and ensure initial system effectiveness.

Responsibility for a supported system without control of the funds is tantamount to responsibility without authority–a good recipe for disaster.■

Secretary Weinberger Swears in Assistant Secretaries of Defense

Secretary of Defense Caspar W. Weinberger presided over the swearing-in of four assistant secretaries of defense August 15 at the Pentagon. Among the four who received the appointments, three were placed in newly created positions.

The three new positions were filled by Dr. James P. Wade, Jr., as assistant secretary of defense (development and support), Dr. Robert S. Cooper, as assistant secretary of Defense (research and technology), and Donald C. Latham, as assistant secretary of defense (command, control, communications, and intelligence). Robert W. Helm was sworn in as assistant secretary of Defense (comptroller).

Dr. Wade is now principal staff assistant and advisor to the secretary of Defense and the under secretary of Defense for research and engineering for Department of defense (DOD) oversight of the development and support of military capabilities represented by deployed system and equipment with U.S. armed forces. Dr. Wade also serves as principal deputy under secretary of defense for research and engineering, a position he held since April 1981. He received a doctorate and master's degree from the University of Virginia, and is a graduate of the U.S. Army Command and General Staff College. In earlier assignments, Dr. Wade was a staff member of the NATO Defense College in Paris. In 1974, he was appointed director, DOD Strategic Arms Limitation Talks Task Force, and deputy assistant secretary of Defense for policy plans and national security council affairs.

Dr. Cooper is responsible for DOD oversight of the maintenance of a superior U.S. technology base, and for the improvement of the DOD approach to selecting the best technology programs to achieve and maintain a qualitative lead in deployed systems. In addition to his new appointment, Dr. Cooper serves as director of the Defense Advanced Research Projects Agency, a position he has held since August 1981. He received his doctorate in electrical engineering from the Massachusetts Institute of Technology. Dr. Cooper was director of NASA Goddard Space Flight Center from 1959 until 1979, and was assistant director of defense research and engineering for DOD from 1972 until 1975.

Mr. Latham will supervise policy for the technologies of command, control, communications and intelligence (C^3I). He has served as deputy under secretary of defense for C^3I since July 26, 1981. Before that, Mr. Latham was the division vice president for engineering, RCA government systems division, from 1978 until 1981. He graduated from The Citadel in 1955, and received his master's degree and an advanced electrical engineering degree from the University of Arizona in 1957 and 1965, respectively.

Mr. Helm, before his appointment as assistant secretary of defense (comptroller), joined the National Security Council staff in June 1982. He was a professional staff member at the Los Alamos Scientific Laboratory from 1975 until 1978. He became a member of the U.S. Comprehensive Test Ban negotiating delegation in Geneva representing the Defense Nuclear Agency and supporting the Joint Chiefs of Staff representative. Mr. Helm joined the Minority Staff of the Senate Budget Committee as senior staff analyst for defense and international affairs. From 1980, until joining the National Security staff, he was senior defense analyst on the Majority Staff of the Senate Budget Committee. On the National Security Council staff his responsibilities included monitoring the DOD Planning, Programming, and Budget System; coordinating defense budget issues with DOD and the Office of Management and Budget, and national security telecommunications policy. Mr. Helm has his master's degree from the Fletcher School of Law and Diplomacy.■

Issues and Actions Affecting the Systems Acquisition Process

(July 1983 - July 1984)

David D. Acker

During the July 1983-July 1984 time frame, the impact of congressional actions and GAO audits on the defense systems acquisition process has become more pronounced than ever before. For example, last year the Congress changed over 3,200 line items in defense programs!

The 535 elected officials and 20,000 staffers have been responding to their obligation to "provide for the common defense" by showing increased concern about the effectivness of the acquisition process. This makes life very difficult for management in the Department of Defense (DOD), management that already has to deal with over 4,000 laws concerning acquisition currently on the books. The laws concerning the acquisition (often referred to as procurement) of defense systems include what one might call a laundry list of economic-dole and social-welfare programs to be imposed on defense contractors.

This year there are about 140 proposed laws affecting the defense systems acquisition process. If passed, the new laws will become effective at the same time DOD and civil agencies are expending additional effort to implement the FAR (the standardized Federal Acquisition Regulation), which went into effect April 1, 1984.

Federal Acquisition Regulation

The FAR, and the DOD FAR Supplement which augments it, have replaced the Defense Acquisition Regulation (DAR). The FAR is to be followed for all new solicitations. The DOD FAR Supplement, containing approximately 1,100 pages, is not a stand-alone document and it must be used in conjunction with the FAR. Federal Acquisition Circulars (FACs) and Defense Acquisition Circulars (DACs) will be published to update the FAR and DOD FAR Supplement. The first change to the DOD FAR Supplement was Defense Acquisition Circular 84-1. Later DACs will be numbered in the same series, e.g., 84-2, 84-3. A number of existing DAR appendices, manuals, and supplements will continue to be used until they are updated, cancelled, or superseded.

Senior Advisory Groups

In September 1983, the House Committee on Government Operations invited then Deputy Secretary of Defense (DepSecDef), Paul Thayer, to describe the measures taken by the Office of the Secretary of Defense (OSD) to avoid favoritism and conflict of interest when appointing civilians to senior advisory groups, such as the Defense Science Board. Secretary Thayer explained that the issues addressed by the committee were covered by existing public law, and DOD directives and instructions. He also told the committee that the senior advisory groups allow the OSD officials to have access to and obtain the advice of the best qualified people in the United States, particularly those people who have some expertise in new and emerging technologies. In recent years it has become increasingly difficult to bring these people into full-time government service.

Independent Research and Development

In a memorandum to the military services and defense agencies, the Deputy Under Secretary of Defense for Acquisition Management asked the various DOD components to be consistent in negotiating advance agreements and in pricing independent research and development (IR&D) and bid and proposal (B&P) costs. Several contractors and one industry association had complained about the lack of consistency among the services in negotiating advance agreements for the contractors' 1983 fiscal year and the pricing of IR&D and B&P for the outyears. In 1983, the memorandum pointed out, ceilings were established for the services to ensure equity in treatment of contractors who had not yet negotiated ceilings with those who had completed negotiations prior to the FY 1983 Defense Appropriations Act.

Proposal Evaluation

In the fall of 1983, the Comptroller General ruled that an agency's downgrading of a proposal, based on unreasonable consideration of past contract performance, entitled the protester to proposal preparation costs. The GAO found that the evaluation factors stated in the Request for Proposal (RFP) specifically listed past performance as a subfactor. In this ruling, the Comptroller General stated that the agency's proposal evaluation, which found the protester's proposal essentially technically equal to the awardee's, had taken these factors and subfactors into consideration. Therefore, the agency had

■ *Mr. Acker is a Professor of Engineering Management in the Research Directorate, Department of Research and Information, at DSMC.*

unreasonably considered past performance as a separate criterion, and that the selection official made findings in this regard which contradicted the underlying technical evaluation.

Testing

Because of perceived "poor" performance of defense systems during operational test and evaluation, the Congress has ordered the creation of an independent test organization (Section 111 of the FY 1984 DOD Authorization Act (PL 98-94)) that would report directly to the Secretary of Defense (SecDef) rather than to the Under Secretary of Defense for Research and Engineering (USDRE). The charter for the new test organization has been written and a new office has been established. This change, of course, directly affects the policy set forth in DOD Directive 5000.3, "Test and Evaluation." Observance of the new policy could result in a longer testing period for DOD acquisition programs. The results of tests conducted under the supervision of the new office will be submitted to the Secretary of Defense and to the Congress.

The Secretary of Defense has found a qualified Director of Operational Test and Evaluation for the new office, and facilities outside the Pentagon are being readied. The office will have a staff of 16—half military, half civilian. There will be close cooperation between the head of the office reporting to USDRE and the head of the office reporting to the Secretary of Defense because any assessment of a defense system will depend on all of the test results obtained—developmental and operational. In coming months, approximately 10 defense system programs in low-rate production are scheduled to be considered for full-scale production. The new office will focus its attention on these programs in the coming months.

Spares

Spare-parts reform, resulting from perceived and actual overpricing of spares, is a complex and massive management challenge. The spares inventories for major defense systems contain almost 4 million different items, many of them low-cost bolts and washers. It is very difficult to identify the spares and to keep track of their prices. During the year, Secretary of Defense Weinberger laid down some firm policies designed to institutionalize improvements in the procurement of spares and to gain firm control over the pricing of spares. The policy reforms include writing tougher contracts, challenging apparent high prices, obtaining refunds, continuing audits, and enhancing competition.

At the direction of the Secretary of Defense, the June 1983 DAR Supplement No. 6 entitled, "DOD Replenishment Parts Breakdown Program," was issued pursuant to the authority contained in DOD Directive 5000.35. The supplement replaced the Joint Regulation entitled, "DOD High Dollar Spare Parts Breakout Program," dated March 1969.

The spares inventories for major defense systems contain almost 4 million different items, many of them low-cost bolts and washers.

The supplement was issued pursuant to DAR 1-103.6 for the guidance of DOD personnel engaged in acquisition (including technical support thereto) of centrally managed replenishment parts for defense systems and equipment. It prescribes a uniform policy and procedures for screening and coding parts. Contracting officers will be provided with summary information regarding technical data and sources of supply to meet the government's minimum requirements. This information will assist contracting officers in selecting the method of contracting, identifying sources of supply, and making other decisions in the preaward and award phases of a defense system program, with consideration for established parameters of system and equipment integrity, readiness, and opportunities to competitively acquire parts. The procedures are based upon the application of sound management and enigneering judgment when determining the feasibility of acquiring parts by competitive procedures, and overcoming or removing constraints to breakouts identified through the screening process.

Warranties

Section 794 of the FY 1984 Defense Appropriations Act (Public Law 98-212) provides that no funds "may be obligated or expended for the procurement of a weapon system" unless the contractors for the system provide certain written guarantees. The law requires that a defense system and each component thereof conform to the stated performance requirements, and the contractor guarantee the system to be free from all defects that would cause it to fail. If a defense system or component fails, the contractor "will bear the costs of all work promptly to repair or replace such system or component as may be necessary to achieve the required performance requirements." If the contractor fails to repair or replace the parts promptly, the contractor will "pay the cost incurred by the United States Government in procuring such parts from another source."

Guidance on warranties is contained in DAR 1-324. The practice of applying warranties when appropriate in competitive firm-fixed-price type contracts has been modified by the statutory requirement to include performance guarantees in all procurements that qualify, regardless of whether they are competitive or not. The provisions of the law require guarantees that reverse the longstanding DOD policy of using warranties selectively at the subsystem and component level rather that at the systems level.

On December 14, 1983, then Deputy Secretary of Defense Thayer issued to the services a 90-day general waiver of the warranties provision contained in the FY 1984 Defense Appropriations Act pending the development of proposed guidance. He believed that the provision was so poorly written that it was difficult to determine what the Congress intended.

In February 1984, Senator Mark Andrews (R-N.D.) accused the DOD of trying to avoid implementing the

warranties provision that he had inserted in to the FY 1984 defense appropriations measure. First, he questioned the justification for the 90-day waiver of the warranties provision. Second, he criticized DOD efforts to have the provision repealed. Secretary of Defense Weinberger told Andrews that because of the "rigidity" of the warranty requirements, it may not be cost-effective to implement them in every acquisition.

On March 14, 1984, Deputy Secretary of Defense William H. Taft IV issued guidance. This guidance waived the requirement for guaranties in cost-reimbursement type contracts. Further, the guidance stated that all government contracts for the production of defense systems or components shall contain a clause that guarantees each defense system and component be designed and manufactured to conform to the government specified performance requirements. At time of delivery, each defense system and component is to be free from such defects in materials and workmanship that would cause the system to fail to conform to the specified performance requirements delineated in the contract. Included in the guidance is a model clause that may be used in contracts for less complex defense systems. For complex defense systems, when the requirements are different, special guarantee clauses may be written. The guidance also states that, during negotiation, care should be taken to identify firm and/or prescribed performance requirements that have been included in the specifications and other relevant documents. Of course, the performance requirements should be realistic and achievable.

Department of Defense officials have been moving reluctantly to carry out the provisions of the law because they believe the requirements will substantially increase contract costs as prime contractors, subcontractors and vendors try to protect themselves against greater risk. The Secretary of Defense has noted that there are selective cases in which DOD can guarantee performance using warranties, such as in the award for improved fighter engines. However, he has also noted that warranties may end up costing DOD more money because contractors raise their prices to cover potential liabilities in the outyears. Senator Andrews believes that warranties can be written to ensure that defense systems work, which is cheaper in the long run and better for national security. The Secretary of Defense shared the latter viewpoint, but in its 1985 budget request DOD asked the Congress to repeal the warranty requirements.

Competition

Competition is a key element of the DOD procurement reform program. Competition advocates, required by law, are now working in all buying commands to challenge all noncompetitive purchases. The results to date are encouraging. For example, competition in aircraft spares has tripled. To ensure continued competition, new contracts will include provisions designed to provide the data necessary to seek second sources of supply when parts are purchased. (See discussion of rights in technical data below.)

On June 27, 1984, the House and Senate approved the "Deficit Reduction Act of 1984," a measure that includes bold, new provisions regarding competition in contracting and bid protest procedures. The provisions are:

—Place competitive negotiations on a par with formal advertising.
—Significantly limit the use of noncompetitive procedures.
—Establish a uniform $100,000 threshold for requiring certification of cost or pricing data.
—Establish competition advocates in each agency and each procuring activity.
—Provide an alternative forum for resolving bid protests involving automatic data processing equipment.
—Codify and expand the current GAO bid protest procedures.

A policy letter setting limits on the use of sole-source contracts was issued March 6, 1984, by the Office of Federal Procurement Policy (OFPP). The policy took effect with the issuance of FAC 84-3 on June 29, 1984.

Property Rights in Technical Data

The subject of data rights and associated compensation policies, a concern to DOD for several decades, is still being debated. In the fall of 1983, the Secretary of the Air Force, Verne Orr, established a new Air Force policy, superseding DAR 7-104.9(a). Secretary Orr requested that a new clause—one requiring contractors to surrender all of their rights in technical data within 5 years after the first delivery of a production item—be added to contracts. The USDRE urged the Air Force to back off, stating the new requirement ignored "the valuable property rights a company or individual has in a process or item." In a similar vein, the Aerospace Industries Association in a letter to the Secretary of Defense stated that the Air Force approach would result in:

—Reduced competition,
—Protracted contract negotiations,
—Increased administrative burdens,
—Reduced performance and reliability,
—Reduced industry-funded military R&D,
—Increased technology transfer problems.

The Navy proposed a new clause entitled "Acquisition of Unlimited Rights in Technical Data and Computer Software"; the Army has not proposed a new clause as of this writing.

Joint Service Program Management

In a report to the Congress in the winter of 1983-1984, the GAO concluded that joint service programs are failures because of the differences in technical and operating requirements in each service, as well as poor program development and coordination. Although the GAO has been a strong supporter of joint service programs, when they will save money, the GAO learned that the concept has not been working. The GAO defined "successful" completion as a combined system operating in the field. Other factors that limit the successful development of a joint defense system include doctrinal differences, such as the "not invented here" syndrome, the civilian-military polarity, and the continuing pursuit of service distinction.

The GAO believes that many of the problems currently being experienced in joint service programs stem from rigid service positions on the system features. Once a joint program is or-

dered and an interservice committee is formed, long and arduous negotiations have to be conducted to accommodate the needs of each service in the combined system. Further, differences in doctrine and technical needs, organizational arrangements, standards, data requirements, manuals, provisioning, integration of training methods, and test requirements lead to major problems. Interservice differences in nomenclature and interpretation also make it difficult for the services to negotiate joint service programs.

The GAO did conclude that the cruise missile is a successful joint program. The success is due to the actions of several sponsors who were key figures in the DOD, the White House, and the Department of State. At every crucial stage in the development of each type of cruise missile, high-level integration was necessary either to start or sustain it.

Cost Growth

Defense system cost growth is not a new phenomenon. It has been studied many times. During the past year, the problem was examined in detail by the DOD and various government, private, and academic institutions. A number of approaches to halt cost growth were proposed, but many similar approaches have been tried before and failed.

Uncontained cost growth manifests itself in the presence of optimistic budgets at the beginning of programs, a lack of understanding of specific requirements, or constrained overall budgets. Cost growth tends to increase program instability because it leads to program cuts or stretchouts.

In March 1984, the DOD reported to the Congress that, for the first time in 10 years, year-end costs for major defense systems had decreased. To maintain control over costs, the DOD has been enforcing the presentation of realistic budget estimates and discouraging the past practice of presenting overly optimistic estimates.

Award Fees for Tailoring Contract Requirements

The Department of Defense is planning to use award fees as a means of encouraging contractors to recommend ways to cut down the number of contract requirements. Award fees should encourage contractors to cooperate in the selective application of contract requirements, including standards and specifications, so that an item can be made better and more cheaply. The effort, initiated in January 1984, envisions that the bulk of the tailoring will take place in the demonstration/validation phase of a program. Initially, the concept is being applied to 12 programs, including the Army Pershing II Missile, the Air Force advanced tactical fighter, and the Navy amphibious assault ship (LHD-1).

Several documents are being revised to reflect the new approach. These include:

—DOD Directive 4120.21. This directive, which covers the application of specifications and standards, is being broadened to include the development of cost-effective contract requirements.

—DOD Handbook 248B. This handbook is being revised to present instructions about applying the tailoring concept.

—DOD Directive 4105.62. This directive deals with source selection. It is being revised to explain how to deal effectively with such factors as past performance and cost realism when making awards. Also, this directive will incorporate the tailoring concept.

—DOD Draft Directive 4245.XX. The text of this forthcoming directive on competitive acquisition is being written to reflect the tailoring concept, including the use of functional specifications.

—Military Standards 961 and 962. These standards are being revised to provide instructions for writing specifications and standards that can be tailored.

—DOD FAR Supplement. A case will be established to include the tailoring concept in a DOD FAR Supplement.

Summary

These actions are taking place now. Changes to the DOD directives and instructions, if they have not already been made, will follow.■

Conferences and Symposia

Software Tools

Software Tools for Distributed Decision Support Systems is the topic of a conference in Chicago on October 22 and 23, and in San Francisco on October 29 and 30. The registration fee of $595 for the two days includes meals, a reception, and a conference text. For more information write Software Tools Conference, Suffolk University, Boston, Mass., 02108, or call (617) 723-2349.

Reliability and Maintainability

Reliability and maintainability are becoming household words in today's society. Whether the subject be a major weapon system on which we depend for our nation's defense or a toaster, TV set, or automobile purchased by John Q. Citizen, these two key-words have an important meaning where customer satisfaction is the issue. The Annual Reliability and Maintainability Symposium provides a forum where R&M engineers can converse with each other and with their management counterparts to outline the importance of their role in the design and manufacture of durable goods to attain this customer acceptance.

The subject of the 1985 symposium in Philadelphia, Pa., on January 22-24, is "R&M—The Key to Customer Satisfaction." It is co-sponsored by nine technical societies and is the largest R&M symposium in the country. Participation and attendance is international. For more information contact H. C. Jones, General Chairman, Westinghouse Electric Corp., MS 3608, P.O. Box 1521, Baltimore, Md. 21203.

Productivity

The Joint Air Force/Industry Electronics Manufacturing Productivity Conference will be held in Charleston, S.C., on November 7-9, 1984. This conference is being sponsored by the Electronic Systems Division, Hanscom Air Force Base, Mass. For additional information call Steve Bloom or Don Winger at (703) 556-8660.■

OFPP Report Relates to Spare-Parts Procurement Practices of the Department of Defense

■ *Editor's note: Dr. William N. Hunter, former Director of the Federal Acquisition Institute and current occupant of the Office of Federal Procurement Policy Chair in the DSMC Executive Institute, uses this space to keep* Program Manager *readers informed about the activities of the Office of Federal Procurement Policy (OFPP).*

Public Law 98-191 directed the Office of Federal Procurement and Policy (OFPP) to conduct a review of Department of Defense procurement practices, regulations, and reform proposals relating to procurement of spare parts, and to send the Congress a report on its findings, conclusions, and recommendations. On June 1, 1984, the Honorable Donald E. Sowle, Administrator of OFPP, submitted the report to the President of the Senate and the Speaker of the House of Representatives.

Background

There are approximately four million spare parts in the DOD system. The services manage 1.8 million of these, while the Defense Logistics Agency manages 2.2 million common parts. The DOD budget for spare parts in fiscal year 1984 was approximately $22 billion.

DOD Reform Program Underway

The OFPP study teams found that the Defense Department is well aware of, and concerned about, spare-parts prices. The Secretary of Defense, the individual services, and the Defense Logistics Agency have undertaken several hundred management initiatives to deal with various aspects of the problem.

The Secretary of Defense issued a memorandum to the services and the Defense Logistics Agency on July 25, 1983, setting out a ten-point action plan. This was followed by another memorandum on August 29, 1983, which mandated 25 additional actions.

There are approximately four million parts in the DOD system.

The DOD budget for spare parts in fiscal year 1984 was approximately $22 billion.

OFPP Recommendations

The OFPP recommendations are aimed primarily at ensuring that the momentum of the present reform initiatives is sustained. They build on the good work that has been done to date, with the objective of integrating the reforms into the procurement system to avoid a recurrence of these problems.

The major recommendations to the Congress, the Secretary of Defense, the services, and the Defense Logistics Agency follow.

For Congress

—Continue oversight of the reforms initiated by DOD, but hold off on legislative action until these reforms have had a chance to produce results. The reform programs will take several years and additional legislation at this time could be counterproductive.

—Support budget requests for necessary people and data-processing capabilities to carry out the reform program. These resources are critical to the success of all the initiatives.

For OSD

—Provide strong and sustained leadership and management attention to ensure OSD initiatives are carried out. Ensure uniformity wherever practical, and coordinate service and DLA efforts. This is an ideal challenge for the OSD procurement executive and a network of procurement executives throughout DOD.

—Sponsor a change to the Federal Acquisition Regulation to make it clear that contractors must furnish cost or pricing data for procurements under $500,000 when requested by the contracting officer. The data need not be certified.

For the Services and Defense Logistics Agency

ARMY

Provide strong leadership in establishing an effective crossfeed program among the major subordinate commands. Ensure resources are allocated among the subordinate commands based on the extent of problems and the potential for improvement.

NAVY

Elevate the reform program to the Naval Material Command (NAVMAT). The Navy contract ad-

ministration office must increase its capability to perform pricing analyses.

AIR FORCE

Ensure the Acquisition Logistics Center is supported so that it can fully realize its intended role as an effective link between the acquisition and support phases of a weapon system.

MARINE CORPS

Assign as many newly authorized people as practical to competition advocate functions, and recruit qualified engineers to review data packages. The Corps should codify new initiatives as soon as possible, with particular attention to breakout. The Corps also should investigate for possible adaptation the data-processing systems that are in use or planned by other services and the Defense Logistics Agency.

DEFENSE LOGISTICS AGENCY

Work more closely with the engineering functions of the services to enhance buying offices' efforts on value engineering and breakout.

For Department of Defense Generally

—Ensure timely and accurate assignment of acquisition method codes. Challenge data rights and restrictive markings.
—Ensure that acquisition strategies and source-selection procedures adequately consider spare parts. Contract data-item descriptions, clauses and special provisions, which improve the ability to compete spare parts, must be developed and then shared with all buying activities.
—Require contractors to:

1. Identify original manufacturers early and throughout the acquisition cycle;
2. Increase competition among their vendors;
3. Provide complete cost or pricing data when needed;
4. Submit accurate and complete technical data and warrant its conformance to contractual requirements; and
5. Explain price increases in excess of a certain percentage (e.g., 10–15 percent) over the previous price paid (adjusted for inflation).■

Send Us Your Articles

Some Tips for Authors

The editors of *Program Manager*, DSMC's bimonthly journal, are interested in your thoughts on policies, trends, and events in the areas of program management and defense systems acquisition. We invite you to submit articles and share your experiences. We are interested in lessons you have learned through your acquisition experiences, both successful and otherwise.

Beyond the demand for good grammar, we have some tips for prospective authors. Consistency and uniformity should be uppermost. The renowned stylist William Strunk, Jr., said "If those who have studied the art of writing are in accord on any one point, it is this: the surest way to arouse and hold the attention of the reader is by being specific, definite and concrete."

Style

Write in the first person, *I, we, our*; and use *you* often. Active verbs are best. Write naturally and avoid stiltedness. Except for a change of pace, keep most sentences to 25 words or less, and paragraphs to six sentences. We reserve the right to edit for clarity and space limitations.

Published articles will include your byline, and brief biography. When there are substantial editorial changes, *Program Manager* clears edited copy with the author.

Where possible, clear articles through your public affairs office or an equivalent authority. Most of the articles we publish are routinely reviewed and cleared by the Director, Security Review, Office of the Assistant Secretary of Defense for Public Affairs.

Length and Graphics

The Basics: Double-space your article using only one side of the paper. One double-spaced page, with a one-inch border on all sides, equals about 250-300 words. We are flexible regarding length, but prefer 2,000-3,000-word articles, which is about 10 double-spaced pages. Don't feel constrained by length requirements; say what you have to say in the most direct way, regardless of length.

We use figures, charts, and photographs. We prefer glossy, black and white photographs, five-by-seven or eight-by-ten, but we cannot guarantee the return of photographs. Do not write anything on the back of photographs. Photocopies of photographs are not acceptable. Charts and figures should be sharp and clear, with legible information and captions. We prefer camera-ready art, but the DSMC Graphic Arts Division can work with sketches if they are clear and precise.

Attribute all references you have used in researching your article. We use separate footnotes, which should be identified at the appropriate place in the copy.

Stories that appeal to our readers, who are senior military and civilian people in the program management/acquisition business, are those taken from *your own* experience rather than pages of "researched information."

Again, be sure to double-space your copy and use only one side of the paper.

If you need to talk to an editor, call:

Robert W. Ball, (703) 664-5974 or Autovon 354-5974

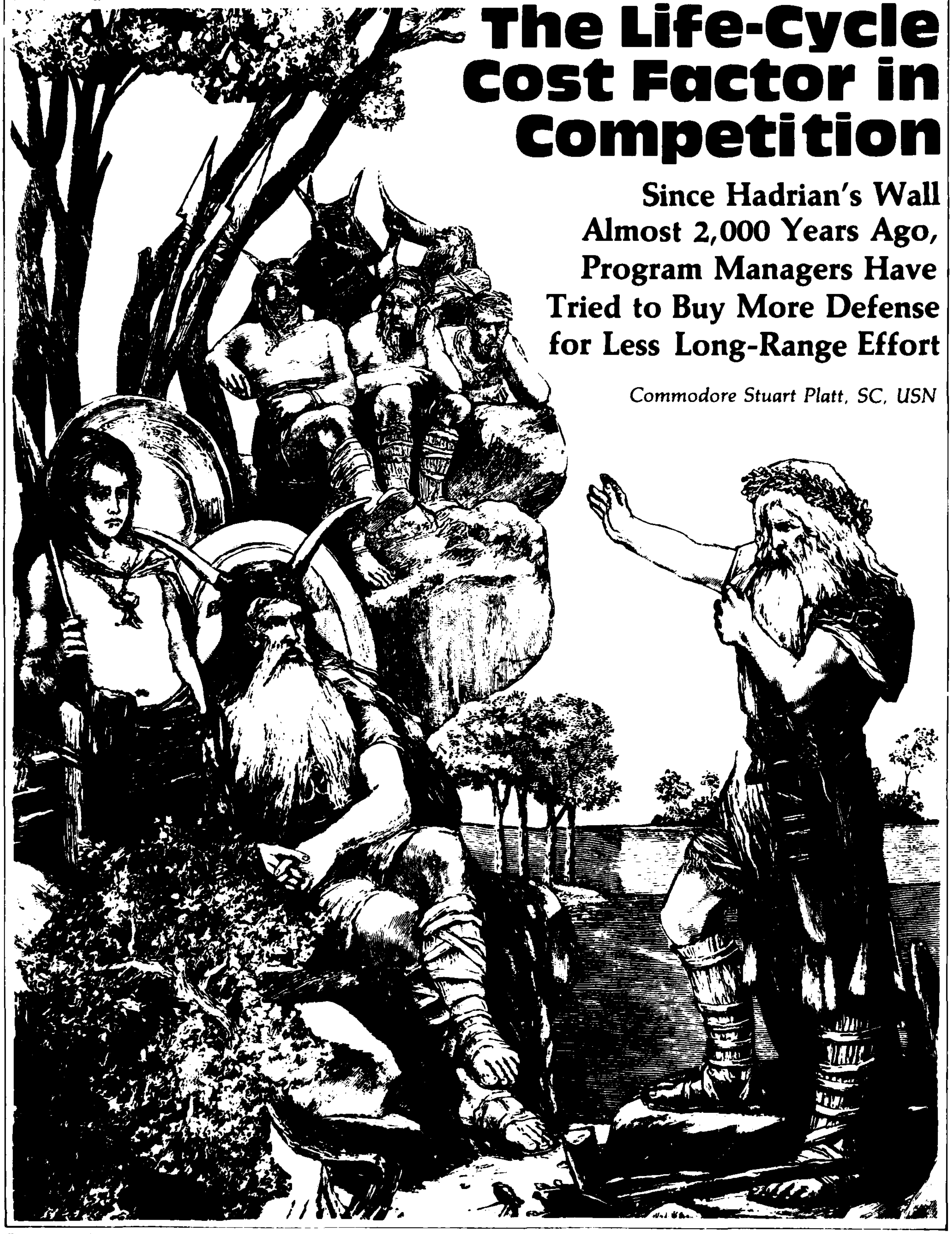
Catherine M. Clark, (703) 664-5992 or Autovon 354-5992.

Or, write us at the Defense Systems Management College, Fort Belvoir, Virginia 22060-5426: ATTN: DRI-P.■

The Life-Cycle Cost Factor in Competition

Since Hadrian's Wall Almost 2,000 Years Ago, Program Managers Have Tried to Buy More Defense for Less Long-Range Effort

Commodore Stuart Platt, SC, USN



In A.D. 122, the new Roman Emperor Hadrian was confronted with a resource management decision. The more civilized populace of Roman Britain was being threatened by barbaric invasions from the North. It was not the first time. Roman legions had been called upon time and again to quell these uprisings only to have them flare up when the troops withdrew. Hadrian recognized that something had to be done to minimize the operation and support costs involved in providing effective protection from the wild northern tribes. He decided to build a wall!

Hadrian's Wall, all 80 miles of it, drastically reduced the cost involved in supporting the operations of a large body of troops. The fixed nature of the wall allowed fewer troops to be kept on station, and the wall also freed the Romans from engaging in expensive, sustained campaigns. Billeting structures constructed at intervals along the wall helped reduce the cost of supporting troops in the field.

The wall was a large investment in time, money and effort, but it served the purpose of reducing the long-term costs of northern operations; and it was successful in its main purpose of protecting the southern regions from invasion. Hadrian, then, gives us a historical example of benefits resulting from a decision based on life-cycle costing.

The Department of the Navy's primary objective in promoting increased competition is to reduce cost and improve the quality of weapon systems, components, and spare parts. We have moved quickly toward this objective by first concentrating on increasing competition in the Navy's acquisition of weapon systems, and in the spare parts element of support. Other support costs and the cost of operating the weapon systems should now receive the same level of attention. We may not be making cost-effective decisions if we focus solely on development and production costs and ignore operation and support costs. We need to consider all these costs during the source-selection process, because total operation and support costs over the life of a system can exceed total development and production costs. Our competition advocates should be attempting to view total costs in effecting competition.

Competitive source selections based on life-cycle costs reflect the same long-term view that must be taken to understand the benefits of the related acquisition issues now being widely discussed, such as warranties, technical data, and reliability and maintainability. When a contractor knows he will remain responsible for his equipment under a materials, workmanship, and performance warranty, he will be induced to build in reliability on the shop floor. Adequate, quality technical documentation and sufficient rights in data will facilitate future competitive reprocurement of components and spare parts. Our ability to support our expanding fleet and keep costs down is increased by considering these issues up-front, before the contract is signed, because at this time the government has maximum leverage.

We may not be making cost-effective decisions if we focus solely on development and production costs and ignore operation and support costs.

Operations and Maintenance Costs

During 1972-1980, the total Navy budget—when measured in uninflated dollars—did not grow. Investment levels in new weapons systems decreased 2 percent; conversely, the operations and maintenance appropriation increased 4 percent. Looking to the 1980-1988 period, we see that the pace of platform replacement and modernization has accelerated dramatically. So the Navy faces a difficult task in resource management. Since the expectation is for continuing congressional funding constraining, we must work to minimize operation and support costs. Simply put, our ability to get a bigger fleet is further enhanced if we can make that fleet cost proportionally less to run.

■ *Commodore Platt is the Competition Advocate General of the Navy. This article is adapted from a June 11 treatise addressed to Navy competition advocates. It should be of interest to acquisition managers throughout the government.*

Life-Cycle Cost as Part of the Procurement Process

Policies and procedures concerning life-cycle costing have been available for many years. They point out that we can be incorrect in our source selections if our emphasis on lowest bid price results in higher final cost to the government, because operating and maintenance costs and service life were not considered in the contract award process. Solicitations should encourage the identification of potential tradeoffs in design, development, production, and operational support.

Life-cycle costs should be considered and formally addressed during acquisition planning, including the preparation of the statement of work, the proposal instructions, and the evaluation criteria and process. Generally, life-cycle costing is appropriate whenever significant operation and support cost savings can be achieved or reasonably estimated.

Part 7.1 of the Department of Defense supplement to the Federal Acquisition Regulation provides:

> *Life-Cycle Cost Criteria.* Since the cost of operating and supporting a system or equipment over its useful life is substantial and, in many cases, greater than the acquisition cost, it is essential that such costs be considered in development and acquisition decisions in order that proper consideration can be given to those systems or equipments that will result in the lowest life-cycle cost to the Government.

Life-Cycle Cost Application

Life-cycle costing is one of the many simultaneous constraints

placed on the acquisition manager. But it is more than just another requirement. Life-cycle costing must be an integral part of our costing control efforts. Properly implemented, it adds to our basic way of doing business: making competitive source-selection decisions to meet modern fighting force requirements at the least total cost.

When life-cycle cost estimates are used in the source-selection criteria, the cost elements should be measureable, relevant, and significant. The types of data that must be provided by the government to the competitors should include the operational and support scenario; the deployment schedule; the constraints on testing requirements and schedule, or on the maintenance and supply policies; the model to be used; the format, timing, and the use of government-supplied background data; and the assumptions and constraints pertaining to interface areas (e.g., reliability and maintainability).

Realities of Implementation

Actually performing a life-cycle cost analysis is rigorous work. It requires overcoming the basic difficulties of cost/benefit tradeoffs—comparison of an immediate known cost against an uncertain stream of costs and benefits over an extended period of time. This analysis also has to deal with the inevitability of program changes, new technology, changing-threat environment, and other such factors that affect all program planning.

Another concern is how to contractually address less-than-promised operating and support costs, recognizing that this situation could occur (our ability to predict fuel costs or even general economic conditions over an extended period of time lacks precision). Adequate provisions in the contract terms and conditions can deter "buy-ins" based on unenforceable promises.

Despite the difficulties in performing a source selection that includes life-cycle cost considerations, logic dictates that life-cycle cost must be considered in choosing between alternatives. Not to do so makes us, according to Benjamin Franklin (as Poor Richard), "penny wise and pound foolish." Two concepts make the analysis more manageable. First, it is not necessary to determine the total cost of the systems, only those costs that vary between alternatives. Second, for some parts of the analysis we may not need to estimate actual costs but only the relative costs of cases under consideration. Finally, in cases where multiple selection criteria are appropriate, life-cycle cost considerations may be made a part of the technical evaluation vice the cost evaluation.

Plan of Action

There are a number of things that competition advocates and other acquisition professionals can do to be sure that life-cycle costing techniques are a part of the competitive procurement process.

—Identify programs with significant operating or support costs that should have life-cycle costs considered during competitive source selections.
—Survey the extent of life-cycle cost techniques used within areas of their responsibility.
—Foster consideration of life-cycle costs in interchanges with contracting, technical, and program management personnel.

—Ensure that life-cycle cost concepts are reflected in acquisition strategies and plans, source-selection criteria, and other procurement documents subject to review.

Summary

Operation and support costs must be contained. Competition gives us a way of cutting costs. As we review the life-cycle cost aspects of acquisitions, we may see more opportunities for competition and may find that current sole-source requirements can be effectively competed. Competition does not always mean we buy from the low bidder for the initial piece of hardware with no thought given to its quality or operational costs; we must not exclude the long-term, total-cost view. To save the most and get the best value for our dollars, we want to buy a rugged, reliable, simple-to-operate, and capable weapon system. As we increase competition in our procurements, it is incumbent upon us to consider the full range of aspects of ownership and the time value of money.■

BRADC Awards $3M Contract to Tiernay Turbines

The Belvoir (Va.) Research and Development Center has awarded a $3 million contract to Tiernay Turbines for ten 5-kW Stirling engine driven generator sets. Stirling Power Systems Corp. of Ann Arbor, Mich., will supply its new V160 Stirling engines to Tiernay under this contract.

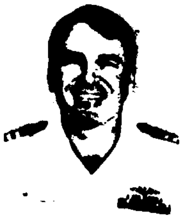
This award is part of an innovative Army program for tactical mobile electric power sources being conducted by the Center and the Department of Defense Project Manager—Mobile Electric Power.

Existing smaller generator sets, while rugged and of good quality, are old, and designed to operate on only one fuel. They are easily detected by the enemy because of the noise and heat they generate, and often do not use the same type fuel as the system's transport vehicles. A Stirling engine generator set is quieter than conventional generator sets, has longer potential life and can use a wide variety of fuels.

The low noise and multifuel characteristics of these Stirling engines have already been demonstrated in tests conducted at the Center on a prototype generator set provided by Stirling Power Systems. This prototype set was operated on kerosene, diesel, and gasoline fuels. The set performed well and had measured noise levels considerably lower than the standard sets.

The new contract calls for delivery of 10 militarized Stirling engine driven generator sets in 1985. These sets will be subjected to extensive testing by the Army to determine the suitability of the Stirling engine for military use. The evaluations will be conducted at several locations throughout the United States and will include performance, environmental, and operational field tests.■

People on the Move



Evans

Hirsch

Captain Lucian C. Evans, USN, is the new Dean of the Department of Research and Information. His last assignment was Director of the Acquisition Policy Office, Chief of Naval Material. Captain Evans received a bachelor's degree in naval science from the U.S. Naval Academy, and a master's degree in systems acquisition management from the U.S. Naval Postgraduate School.

Edward Hirsch is a Professor of Systems Acquisition Management in the Department of Research and Information. He came to DSMC from the Computer Sciences Corporation, where he was a Senior Advisor and Deputy Director. Mr. Hirsch holds two degrees from the University of Maryland, a bachelor's degree in military science, and a master's degree in international relations and law.

Jaudon

McCauley

Commander Joel B. Jaudon, USN, is an Instructor in the Acquisition Management Laboratory, School of Systems Acquisition Education. His last assignment was Director of Logistics at the Joint Cruise Missiles Project. Commander Jaudon holds a bachelor's degree in naval science from the U.S. Naval Academy, and a master's degree in industrial management from George Washington University.

Colonel Thomas H. McCauley, USAF, is the new Dean of the School of Systems Acquisition Education. He was assigned to DSMC from Wright-Patterson Air Force Base, Dayton, Ohio, where he was Assistant for Management Information Systems. Colonel McCauley, a graduate of PMC 79-2, holds a bachelor of science degree from Pennsylvania State University, and a master of science degree from the University of Pittsburgh.

Rossi

James H. Rossi is a Professor of Financial Management in the Business Management Department, School of Systems Acquisition Education. Prior to this assignment, he was a Comptroller Division Director with the Naval Air Systems Command. Mr. Rossi holds a master's degree in public administration from American University.

Additions

Jeanette Montoya has returned to DSMC to be Secretary to the Dean, Department of Research and Information.

Barbara Shelton, School of Systems Acquisition Education.

Judy Smith, Department of Administration and Support.

Promotions

Denise Abernathy, USN, Audiovisual Division, to Seaman.

Kaye Gibson, USN, Audiovisual Division, to Petty Officer Third Class.

Dennis Hagenow, USAF, Audiovisual Division, to Technical Sergeant.

Michael Hill, USA, Audiovisual Division, to Sergeant First Class.

Michael McKenna, USAF, Duplicating Division, to Master Sergeant.

Lori Rehfeldt, USAF, Audiovisual Division, to Staff Sergeant.

William Wenger, USA, Audiovisual Division, to Staff Sergeant.

Losses

Joyce Stapleton Atwell, Secretary to the Dean, School of Systems Acquisition Education, resigned to accompany her husband, Major Robert C. Atwell, USA, a graduate of PMC 84-1, to St. Louis, Mo.

William G. Gicking, Registrar, Department of Administration and Support, retired.

Helen Pinkerton, Secretary to the Commandant, retired.

Commander Charles T. Ristorcelli, USN, Policy and Organization Management Department, transferred to the Naval Electronic Systems Command (PDE-107), Arlington, Va., to work in systems acquisition.

Lieutenant Colonel Ray D. Spinosa, USA, Acquisition Management Laboratory, retired. He will continue to reside in the local area.

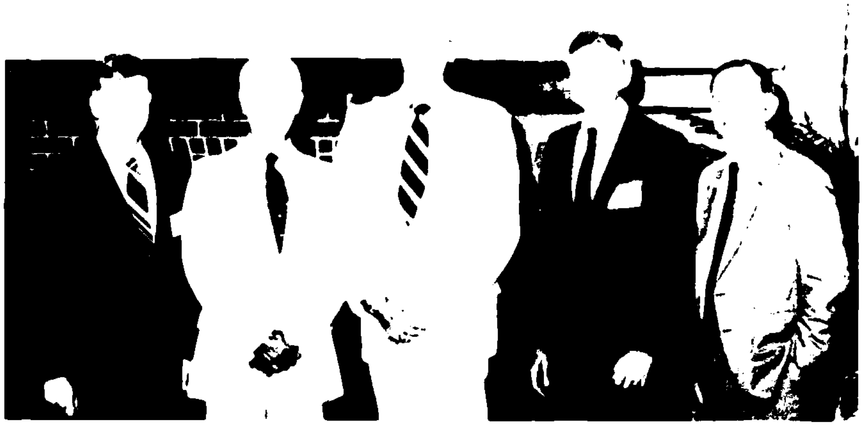
Foreign Policy, American Values

"Americans, being a moral people, want their foreign policy to reflect the values we espouse as a nation. But Americans, being a practical people, also want their foreign policy to be effective. If we truly care about our values, we must be prepared to defend them and advance them. Thus, we as a nation are perpetually asking ourselves how to reconcile our morality and practical sense, how to pursue noble goals in a complex and imperfect world, how to relate our strength to our purpose—in sum, how to relate power and diplomacy."

Secretary of State George P. Schultz before the Washington Plenary Meeting of the Trilateral Commission, April 3, 1984.

INSIDE DSMC

DSMC Alumni Meet for Campus Reunion



Past Commandants at reception and banquet. Brigadier General Benjamin J. Pellegrini (USA, Ret.); Lieutenant General John G. Albert (USAF, Ret.); present Commandant, Rear Admiral Roger D. Johnson, USN; Major General William E. Thurman, USAF; Colonel Thomas V. Forburger, USA.

Alumni from the first Program Management Course 71-1 through the last graduating class, 84-1, returned to the College campus June 14-15 to participate in the Defense Systems Management College Alumni Association's first Program Managers Symposium. The alumni plan to hold the event annually.

Using the theme "Shortening the Acquisition Cycle," the first-day agenda included Norman R. Augustine, President of Denver Aerospace, and Vice President of Martin Marietta Corporation, demonstrating his insight and wit in the keynote address. He was followed by a panel representing the various service secretaries, and one featuring members of key congressional staffs. The Honorable David E. Sowle, Administrator of the Office of Federal Procurement Policy, and the Honorable David S. C. Chu, Director of Program Analysis and Evaluation, OSD, provided up-to-date information and opportunities for lively audience participation. Mr. Robert Fuhrman, President of Lockheed Missiles, Space and Electronics Group, delivered the luncheon address.

A highlight of the symposium was the Thursday night reception honoring past commandants of the Defense Systems Management College: Lieutenant General John G. Albert, USAF (Ret.); Major General William E. Thurman, USAF; Brigadier General Benjamin J. Pellegrini, USA (Ret.); Colonel Thomas V. Forburger, USA; and current Commandant Rear Admiral Roger D. Johnson, USN, all of whom accepted Honorary Member certificates. General Thurman, presently the B1-B Program Manager, was the banquet speaker.

The second day began with an overview of what is happening at DSMC, as well as plans for the future, presented by Captain Michael A. Pearce, USN, former Dean of the School of Systems Acquisition Education. A variety of workshops comprised such topics as procurement initiatives, cost reduction, acquisition logistics, human productivity, software acquisition, the Program Managers Support System (PMSS), and radical ideas for shortening the acquisition cycle.

After a luncheon focusing on the alumni association, members took part in the annual business meeting when officers for fiscal year 85 were installed.

Indications are that this first event was an overwhelming success. Plans are in progress for the second Program Managers Symposium in June 1985. ■

Keynote Speaker Norman R. Augustine.

Congressional staff panel David Willson (HAC), Martin Faga (HPSCI), Donald Campbell (MASC).

The Honorable David S. C. Chu, Director Program Analysis and Evaluation, OSD.

Front row: Thomas Christensen, board member; Fred Wynn, President; LCDR Bill Montgomery, USN, Vice President, Membership and Programs; Maj Michael McLendon, USAF, board member; Kenneth Blum, Treasurer. Back row: John Ferney, board member; Fred Dunbar, associate board member; Al Hey, board member; Joanne Barreca, immediate Past President; CDR Robert Springer, USN, Vice President, Operations; Chuck Tringali, board member; Otto Thamasett, board member. John K. Burnham, Secretary, is not pictured.

Ted Ingalls discusses the Program Managers Support System with workshop participants.

Robert Fuhrman delivers Thursday luncheon address.

James E. Williams, Jr., Deputy Assistant Secretary of the Air Force (Acquisition Management); Melvin R. Paisley, Assistant Secretary of the Navy (Research, Engineering and Systems); Dr. Jay R. Sculley, Assistant Secretary of the Army (Research, Development and Acquisition).

Donald E. Sowle, Administrator, Office of Federal Procurement Policy.

The 1984-85 Academic Calendar
for the Defense Systems Management College

Course No./Location*	Dates
Program Management Course (PMC)	
85-1	18 Jan 85-7 Jun 85
85-2	29 Jul 85-13 Dec 85
Program Managers Workshop (PMW)	
85-1	9 Oct 84-2 Nov 84
84-1**	27 Nov 84-29 Nov 84
85-2	29 Apr 85-24 May 85
85-1**	23 Apr 85-25 Apr 85
85-3	15 Jul 85-9 Aug 85
85-2**	17 Sep 85-19 Sep 85
Executive Refresher Course (ERC)	
85-1	3 Dec 84-21 Dec 84
85-2	25 Feb 85-15 Mar 85
85-3	9 Sep 85-27 Sep 85
Systems Acquisition Management for General/Flag Officers (SAM)	
85-1	13 Nov 84-16 Nov 84
85-2	5 Feb 85-8 Feb 85
85-3	9 Apr 85-12 Apr 85
Multinational Program Management Course (MPMC)	
85-1	29 Oct 84-2 Nov 84
85-2	4 Feb 85-15 Feb 85
85-3	20 May 85-24 May 85
85-4	5 Aug 85-16 Aug 85
Policy and Organization Management Course (POMC)*	
85-1R/Los Angeles	22 Oct 84-9 Nov 84
85-2	3 Dec 84-21 Dec 84
85-3R/St. Louis	7 Jan 85-25 Jan 85
85-4R/Huntsville	4 Mar 85-22 Mar 85
85-5	22 Apr 85-10 May 85
85-6R/Los Angeles	13 May 85-31 May 85
85-7R/Huntsville	10 Jun 85-28 Jun 85
85-8R/Boston	8 Jul 85-26 Jul 85
Business Managers Advanced Workshop (BMAW)	
85-1	7 Jan 85-11 Jan 85
85-2	26 Aug 85-30 Aug 85
Contract Finance for Program Managers Course (CFPMC)	
85-1	26 Nov 84-30 Nov 84
85-2	14 Jan 85-18 Jan 85
85-3	15 Apr 85-19 Apr 85
85-4	26 Aug 85-30 Aug 85
Systems Acquisition Funds Management Course (SAFMC)	
85-1	22 Oct 84-26 Oct 84
85-2	11 Mar 85-15 Mar 85
85-3	13 May 85-17 May 85
85-4	9 Sep 85-13 Sep 85
Contractor Performance Measurement Course (CPMC)	
85-1	22 Oct 84-26 Oct 84
85-2	3 Dec 84-7 Dec 84
85-3	14 Jan 85-18 Jan 85
85-4	25 Feb 85-1 Mar 85
85-5	18 Mar 85-22 Mar 85
85-6	15 Apr 85-19 Apr 85
85-7	20 May 85-24 May 85
85-8	10 Jun 85-14 Jun 85
85-9	29 Jul 85-2 Aug 85
85-10	23 Sep 85-27 Sep 85
Business Management Package Course (BMC)*	
85-1R/Huntsville	15 Oct 84-2 Nov 84
85-2R/Los Angeles	26 Nov 85-14 Dec 84
85-3	3 Dec 84-21 Dec 84
85-4R1/St. Louis	4 Mar 85-8 Mar 85
85-4R2/St. Louis	18 Mar 85-22 Mar 85
85-4R3/St. Louis	1 Apr 85-5 Apr 85
85-5R/Los Angeles	15 Apr 85-3 May 85
85-6	3 Jun 85-21 Jun 85
85-7R/Huntsville	5 Aug 85-23 Aug 85
85-8R1/Boston	26 Aug 85-30 Aug 85
85-8R2/Boston	9 Sep 85-13 Sep 85
85-8R3/Boston	30 Sep 85-4 Oct 85
Technical Managers Advanced Workshop (TMAW)	
85-1	14 Jan 85-18 Jan 85
85-2	10 Jun 85-14 Jun 85
Management of Software Acquisition Course (MSAC)	
85-1	26 Nov 84-30 Nov 84
85-2	18 Mar 85-22 Mar 85
85-3	3 Jun 85-7 Jun 85
85-4	23 Sep 85-27 Sep 85
Management of Acquisition Logistics Course (MALC)	
85-1	10 Dec 84-14 Dec 84
85-2	13 May 85-17 May 85
85-3	24 Jun 85-28 Jun 85
85-4	26 Aug 85-30 Aug 85
Defense Manufacturng Management Course (DMMC)	
85-1	22 Oct 84-26 Oct 84
85-2	15 Apr 85-19 Apr 85
85-3	17 Jun 85-21 Jun 85
Technical Management Package Course (TMC)*	
85-1R/Huntsville	26 Nov 84-14 Dec 84
85-2R/Los Angeles	7 Jan 85-25 Jan 85
85-3R/St. Louis	13 May 85-31 May 85
85-4R/Los Angeles	1 Jul 85-19 Jul 85
85-5	8 Jul 85-26 Jul 85
85-6R/Huntsville	15 Jul 85-2 Aug 85

For information about courses, call the Registrar's office at (703) 664-2152 or Autovon 354-2152.

*An R after class offering indicates Regional offerings. Locations as stated.

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